

Examining Record Keeping and Benchmarking Effects on the Production and Performance of Cow-calf Farms in Canada

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by

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ABSTRACT

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Farmers and ranchers seek to adopt appropriate management practices tools and utilize a variety of strategies to reduce costs, increase productivity, and improve overall performance. This thesis was conducted to examine how appropriate management tools, specifically record keeping and benchmarking, affect production and performance on cow-calf farms in the Canadian Prairies and how market orientation and organizational learning mediate this relationship. Concurrently, this thesis looks at opportunity discovery within cow-calf operations, and what producers are doing to become more profitable.

A theoretical framework was developed around managerial factors (market orientation and learning orientation), strategic factors (efficiency and product differentiation), and management tools (record keeping and benchmarking). Several hypotheses were built to examine the impact of these factors on beef production in the Canadian cow-calf industry. This thesis sheds more light on why record keeping and benchmarking are important for producers, what kind of factors influence cow-calf producers to use these management tools, and how managerial, structural factors, and management tools affect beef production efficiency and overall performance.

Data was collected from mail and internet surveys of 110 cow-calf producers in Alberta, Saskatchewan, and Manitoba. Estimations are carried out using Binary Logit and Ordinary Least Squares models. Specifically, a Binary Logit model was used to examine the factors affecting the use of record keeping and benchmarking, and an Ordinary Least Squares model was applied to

examine how managerial and structural factors, in addition to market orientation and learning orientation, affect production efficiency. The results suggest that almost all cow-calf producers have some level of record keeping but a significant number of them did not use benchmarking (comparisons with others). In addition, learning oriented producers were most likely to use both record keeping and benchmarking. Furthermore, benchmarking was also found to lead to greater beef production efficiency.

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Chapter 1: Introduction and Background Information

1.1 Introduction

Farmers and ranchers, like other business owners, seek to reduce costs, increase revenue, and improve productivity and overall performance. In order to do so, ranchers require sound management to prosper as well as offer buyers cattle that will perform well at the feed yard and on the processing floor (Williams & Page, 2011). Adopting recommended management practices tools and utilizing a variety of strategies could provide an opportunity to farm businesses. Therefore, the efficient implementation of agricultural management practices tools needs to be addressed, which means farmers need to decide if to adopt and use profitable management practices tools properly. In addition, changes in consumers' and buyers' tastes affect the demand for agricultural products, so understanding their needs and expectations is important as well.

How cattle producers enhance their performance, reduce costs and adopt appropriate technologies and management tools have drawn some attention from scholars and practitioners (e.g. Dunn & Ph, 2002; Griego, Geroy, & Wright, 2000; Hersom, Thrift, & Yelich, 2011; Micheels & Gow, 2014; Micheels & Gow, 2010; Pruitt, Gillespie, Nehring, & Qushim, 2012; Ramsey et al., 2005). For instance, Hersom et al. (2011) found that the adoption of recommended practices tools and technologies, such as, antibiotics, implants, and vaccines that can reduce resource inputs of feed in the US beef industry make important contributions to the efficiency of beef production. Also, Pruitt et al., (2012) studied the adoption of technologies, management practices, and production systems (TMPPS) by US beef cattle producers in nine different regions. They specifically analyzed how the use of information technologies and record keeping can improve individual animal performance.

Additionally, a variety of strategies, which embrace market orientation and organizational learning aimed at gaining a competitive advantage, have been successfully addressed and discussed in the management and marketing literature (e.g. Beverland & Lindgreen, 2007; Jim énez-Jim énez & Cegarra-Navarro, 2007; Micheels & Gow, 2014). Market orientated firms make meeting the needs or wants of their target buyers and customers their primary business motivation (Hurley & Hult, 1998). Organizational learning (learning orientation) is conceptualized as a basic attitude towards learning that facilitates the organizational and managerial learning process (Sinkula, Baker, & Noordewier, 1997).

Beverland & Lindgreen (2007) found that New Zealand's fastest growing companies primarily put customers first, by listening, understanding and serving them. Similarly, Jim énez-Jim énez & Cegarra-Navarro (2007) found that market-oriented and learning-oriented firms in Spain can provide and offer a good service based on consumers' needs, while improving overall performance and building competitive advantages. Moreover, the studies indicated that market orientation and learning orientation are highly correlated and have overlaps based on their definitions and practices (Jaworski & Kohli, 1993; Slater & Narver, 1995). These studies have pointed out the direct influence of market orientation and learning orientation on firm performance (Jim énez-Jim énez & Cegarra-Navarro, 2007; Micheels & Gow, 2008, 2014; Slater & Narver, 1995). In this respect, these management strategies should also apply to agriculture production (Micheels et al., 2010). For instance, market oriented and learning oriented cow-calf producers should know what kind of calves feedlot owners want and potentially what slaughter plants request. If they cannot initially meet feedlot owners' requirements, they are most likely to learn from others as well as improve themselves to meet the needs. Therefore, cow-calf

producers who meet feedlot owners' needs can gain a competitive advantage in the Canadian beef industry.

Both empirical and theoretical studies have investigated the linear or causal relationships among market orientation and learning orientation thereby examining their combined impact on firm performance (Jiménez-Jiménez & Cegarra-Navarro, 2007; Micheels & Gow, 2014). Most of the empirical studies focused on non-agricultural industries with very few examining grain and livestock sectors in western/developed countries. The Canadian beef industry in general, and the beef cow-calf sector in particular, have not been investigated. In addition, very little attention has been directed at studying the management practices (related to record keeping and benchmarking) and productivity measures in the Canadian cow-calf industry.

This thesis looks to fill the gap in empirical studies on market orientation and organizational learning in the Canadian beef cow-calf industry and their connection with adoption of recommended management practices and tools. In order to fill this gap, this thesis will investigate how record keeping and benchmarking affect cow-calf production and overall performance and how the constructs of market orientation and organizational learning mediate this relationship.

1.2 The Canadian Beef Cow-calf Industry Background

In the Canadian beef industry, more than 80% of the beef cows are located in the Western provinces of Alberta, Saskatchewan, and Manitoba (Statistics Canada, 2015a). Feed availability and feed costs are the main factors for the distribution of beef numbers in Canada (Statistics Canada, 2015a). Because the Western provinces have a wealth of natural resources, such as fresh water, wide-open spaces, arable land, and perennial pasture, it leads to a significant production

cost advantages for beef production and processing. For example, Alberta is home to 40.4 percent of Canada's 3.8 million beef cows (Duchworth, 2015; Statistics Canada, 2015b). Furthermore, the beef sector in Western Canada contributes approximately \$9 billion in gross domestic value and provides total employment of 127,677 fulltime jobs directly and indirectly (Kulshreshtha, Modongo, & Florizone, 2012). Thus, the beef production industry in Canada plays a very important role in the national and provincial economies (Services Canfax Research, 2012).

The Canadian beef industry can be divided into three sectors: cow-calf operations (which includes both pure breed producers and commercial producers), backgrounders, and the finishers or feedlots. Only the cow-calf sector will be focused on in this thesis. A cow-calf operation is the starting point for commercial beef production, producing feeder calves for the beef industry. Primarily, there are spring-calving herds in Canada where calves nurse their mothers until they are approximately 7 months of age (400-600lbs), at which point they are weaned (separated from their mothers). Feed, both winter and summer, accounts for more than 60 percent of a cow-calf operation's annual costs (Larson, 2012) as shown in the breakdown of costs in Figure 1.1. Increasing input costs, increasing land prices, and weather events (e.g. drought) have drove feed costs higher (Saskatchewan Forage Council, 2011). In an effort to minimize costs to remain financially sound, producers have adopted extensive feeding alternative (e.g. bale grazing, swath grazing, crop residue) (Sheppard et al., 2014; Western Beef Development Centre, 2015).

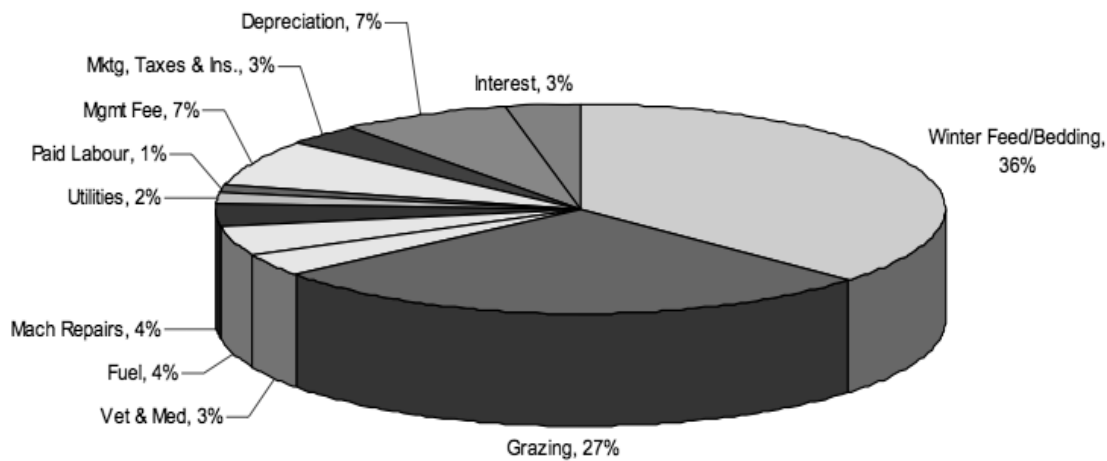


Figure 1.1 Breakdown of Cow-Calf Costs of Production
Source: Larson, 2012

Revenues for cow-calf operations are primarily generated from the sale of weaned calves, cull cows, and bulls on a per pound basis, so productivity and weight of animals is important. A producer's price is determined by the quality and weight of the animal, therefore beef production, or animal weight, will be important to a producer's revenues. In general, cow-calf producers have little influence on cattle prices and are often deemed price takers in the market¹. The average Canadian herd size has changed dramatically over the last two decades: from an average 56 head in 1990 to 158 head in 2015 (Statistics Canada, 2015b). With over 82,500 farms with cattle in Canada (Statistics Canada, 2015b), the cow-calf industry is an example of a perfectly competitive market. Consequently, it is important for farm managers to minimize their cost of production and maximize beef productivity in order to be profitable and sustainable.

In Canada, cow-calf producers typically sell their weaned calves through an auction market, directly sell to feedlots, or retain ownership and background their calves (Brown, 2015;

¹ Currently, new programs like Western Livestock Price Insurance Program (WLPPI) and AgriClear are enabling producers to set their floor price.

Larson, 2015). In the 2014 western Canadian Cow-calf Survey, close to 90% of survey respondents indicated they sold their calves via live auction (Western Beef Development Centre, 2015). Some of cow-calf producers sell their calves to feedlot owners directly or through the order buyers². In the case of retained ownership, cow-calf producers might sell background calves to a finishing feedlot through auction market or order buyers. Despite several methods for cow-calf producers to sell their weaned calves, the eventual path for calves is to feedlot owners.

1.3 Managerial Skills: Market Orientation and Organizational Learning

1.3.1 Market Orientation

The term “market orientation” has found broad appeal in marketing literature. Kohli & Jaworski (1990) describe market orientation as a set of behaviours and processes in an organization , and Narver & Slater (1990) define market orientation as an aspect of culture to create superior value for customers. Hunt & Morgan (1995) state the term as a resource for decision making. For instance, based on Narver & Slater's (1990) behavioral theory, market orientation contains three behavioral components: customer orientation, competitor orientation and inter-functional coordination. Kohli & Jaworski (1990) use market orientation as a process approach to explain the implementation of a marketing concept through market intelligence generation, intelligence dissemination, and responsiveness in order to apply a marketing strategy. Ruekert (1992) identified three components of market orientation: obtaining and using customer information, developing a strategic plan based on such information, and implementing the plan to respond to customer needs. According to these researchers, market orientation is a cognitive, behavioral,

² Order buyers are middleman, which provide many services to feedlot owners. Order buyers contact the feedlot owners regarding specific needs. Usually, the order buyers charges a commission for the services that they provide to the feedlot owners.

and cultural aspect of a firm's marketing concept that puts the customers/buyer at the center of the organization and its development (Rohit, Frederick, & Webster, 1989).

The fundamental concept behind market orientation is that if firms can better understand their customers' and buyers' needs, competitors' actions and market demands, they should be able to improve performance. Many researchers have found that market oriented firms have superior performance across a variety of industries and areas (Chang, Mehta, Chen, Polsa, & Mazur, 1999; Eris, Neczan, & Ozmen, 2012; Micheels & Gow, 2008, 2014). For example, market oriented firms are effective in performance enhancement in the logistics sector in Turkey (Eris et al., 2012). Although this strategy in different industries has shown to improve performance by satisfying buyers' needs, there is still a gap in the literature on how firms implement management tools in the market orientation process. This thesis examines the circumstances in which market orientated firms utilize appropriate management practice tools and technologies to improve performance.

1.3.2 Organizational Learning

Slater & Narver (1995) and Baker & Sinkula (1999) both have suggested that market orientation only improves performance when it is combined with organizational learning. Moreover, Sinkula (1994) and Slater & Narver (1995) have also pointed out that market orientation will be substantially more effective with the help of learning orientation. According to Baker & Sinkula (1999), organizational learning has a direct effect on firm's core learning competency and includes: commitment to learning, open-mindedness, and shared vision, as well as, it influences its propensity to create and use knowledge. Specifically, since market-oriented firms focus on customers and competitors in established markets, they could ignore emerging markets and new

technologies. However, organizational learning fosters a set of knowledge-enhancing values that influence the adaptive behaviors provided by market orientation to a higher level learning that leads to the development of improved products, services, and technologies, and the exploration of new markets (Slater & Narver, 1995). Furthermore, organizational learning is mostly directly linked to the performance of firms. Micheels & Gow (2014) express that organizational learning supports market orientation and thus, impacts the performance of beef farmers in the U.S.

From the aspect of learning orientation, theoretically utilizing management tools should allow cow-calf producers to identify gaps and opportunities to improve productivity and minimize cost. Therefore, this thesis examined how learning orientated and market orientated cow-calf operations implement managerial tools that affect overall performance by reducing production and opportunities gaps. The research here examines how firms use management practice tools to discover and identify the gaps and opportunities.

1.4 Strategic Management Theory

A firm has two basic strategic options. One is focus on productivity, and the other is focus on differentiation (Porter, 1980). Strategic planning is a predetermined approach to organize resources to produce agricultural commodities, and the resources need to be organized into the proper amounts and combinations. In order to allocate resources efficiently, cattle ranchers can use economic principles to identify and make better informed decisions. Before farmers make any further decisions, goals should be established. Traditional economic theory suggests firms are profit maximizing, but managers often do not explicitly pursue the maximization of profits because it is difficult to determine how close a firm is to maximum profits and because profits can be difficult to predict (Armstrong & Green, 2006). However, this thesis stipulates profit

maximization as a manageable goal. Theoretically, profit can be identified by a comparison of total revenue and total cost. The quantity of output that achieves the greatest difference of total revenue over total cost is profit maximization, which is shown in the following equations.

$$\text{Profit} = \text{Total Revenue} - \text{Total Cost} \quad (1)$$

$$\pi = TR - TC \quad (2)$$

$$\pi = Py - wX \quad (3)$$

Within those equations farm profit is found by subtracting variable costs and fixed costs from revenue where P is the price (e.g. price of cattle) received by farmers / ranchers, y is quantity produced, w is the per unit input cost, and X is input quantity. There are three ways for farmers and ranchers to increase profit:

- a) Reduce the costs (mainly focus on direct costs /variable costs), *ceteris paribus*;
- b) Increase gross product, *ceteris paribus*;
- c) Combine and implement a) and b) simultaneously (improve gross margin).

Key distinction in cost is variables and fixed cost. Fixed costs are those costs that do not changes as output changes, for example, land, fences, and equipment. Variable costs are those costs that vary with output (direct costs). In cow-calf farms, these refer to changes in costs as cow numbers increase or decrease, and include feed, bedding, grazing, salt & mineral, veterinary & medicine. Gross product refers to the gross value of production. This includes cattle sales minus purchases. It also includes changes in the value of the farmers' breeding stock. Gross margin is a measure of the economic (production) efficiency of the farmers' herds. It is calculated by subtracting the direct costs of production from gross revenue. For price-taking firms, increasing the efficiency of production is an only means to increase profit.

While improving beef production is important, exploring a differentiation strategy can also increase performance. Farmers are often aware of prices other farmers receive for their products (Kahan, 2013), and recently producers have begun to pay more attention to production benchmarks in their area (Ringwall, 2015). Benchmarking is a process of determining what is the top standard being reached by comparison with others, which is an important management tool for improving performance (Elmuti & Kathawala, 1997). Record keeping analysis, which is the continuous collection of production and financial information by farmers for self-evaluation of their productivity, is also important (Waters, 2012; Yami, 2009). A detailed definition and description of benchmarking and record keeping is provided in Chapter Two. The use of information and practical tools, such as benchmarking and record keeping, can identify new opportunities for improvement. These could be powerful tools and may help focus efforts on the opportunities to improve profit as well as overall performance.

1.5 Previous Research

Although research into management practices has provided some relevant insights, there are still certain aspects that have not been sufficiently analyzed. For example, Vilorio Carrillo (2010) pointed out record keeping positively influences economic results in Venezuelan hog farms; however, this study did not consider benchmarking. Ideally, farmers should calculate their own production indicators (record keeping analysis), but it is useful to have benchmarks to compare oneself with, in order to identify areas where there is a room to improve. In Pruitt et al.'s (2012) study, they focused on the rate of adoption of management practices and technology but did not examine the impact of management practices or technologies on productivity measures.

Very little attention has been directed at studying management practices such as record keeping and benchmarking in the Canadian cow-calf industry. Evidence suggests that most of the studies have been done on operations in the United States and Europe. There are different factors contributing to organizational performance between Canada and other countries due to differences in relation to the economic structure, regulatory aspects, competitive environment, and culture. Most studies that have examined the relationship between beef producers and consumers, have not considered the cow-calf producers and their relationships with cattle buyers and feedlot owners. Furthermore, most scholars have researched on product and production-based strategies in the livestock industry; however, exploring opportunities and creating value for producers only draws a little attention in previous literature.

1.6 Objective and Thesis Structure

The aim of this thesis is to empirically examine how record keeping and benchmarking affect production and performance on cow-calf farms in Canada and in what way the constructs of market orientation and organizational learning mediate this relationship. In order to achieve the goal of this thesis, the following research questions will be considered:

- What kind of record-keeping tools do agricultural producers use that can help them become more efficient, be more profitable, and increase the value of their cattle?
- Are farms that use benchmarking and record keeping more likely to be “better” managers?

The thesis begins by explaining benchmarking and record keeping in the context of the cow-calf industry in the prairies. Next, the thesis proposes a model of market orientation, organizational learning, and firm performance based on a farm’s decision making which

embraces costs, goals and experiences. This discussion provides several hypotheses. The thesis then turns to an examination of the cow-calf industry in western Canada as a case study. An economic analysis evaluates the potential effect on the costs, profit and efficiency in western Canada cow-calf farms through adapted market orientation and organizational learning as managerial skills. The thesis concludes with a discussion of the results of the cow-calf industry analysis and suggestions for further research.

Chapter 2: Literature Review

2.1 Introduction

Nowadays, almost every global agricultural marketplace is fluctuating and changing with a myriad of factors including market risk, mechanization, increasing farm size, adoption of new production tools, and new marketing choices (Kay, Edwards, & Duffy, 2011). Canadian agriculture sectors also face similar challenges to the global agricultural marketplace. From the perspective of the majority of producers, the industry is extremely competitive in Canada, especially the livestock sector (Sparling & Thompson, 2011). Commodity beef comes from many different producers. A steak can be produced by a producer from Saskatchewan, or Alberta, or even could come from other countries.

The Canadian beef industry is one of the leading beef producing countries in the world and plays a significant role in the agriculture sector (Brocklebank, Hobbs, & Kerr, 2008); however, this sector has been struggling to respond to changing buyer tastes and the strategies of its global competitors (Brocklebank et al., 2008). New generations of farmers and ranchers allocate resources to continually discover new opportunities. Also, management tools have always been regarded as an important resource, but most tools are mainly used in the area of financial decisions rather than production decisions. The adage “you cannot manage what you do not measure” is well-respected, but not often followed.

There are a large number of cow-calf producers in the Canadian beef market (more than 82,000 cow-calf producers across the nation) (Statistics Canada, 2015a), making it a competitive market. Thus, a single cow-calf producer cannot influence the market price and is referred to as a price taker. Due to the structure of the western beef supply chain, most cow-calf producers sell their calves to feedlot producers (The Canadian Cattlemen’s Association, 2015). Based on these

reasons, the cow-calf sector is competitive, and cow-calf produces are usually recognized as price takers. If cow-calf producers want to remain competitive, they need to utilize current proven management tools, employ continuous learning, and adopt new management tools and technologies to attract additional buyers and maintain existing buyers. The use of management tools, such as record keeping and target setting, enables firms to overcome the challenges of unstable markets (Bloom, Reenen, Dowdy, & Rippin, 2005). Hersom et al.'s (2014) study found that utilizing recommended management tools such as record keeping, business plans, genetic selection, and selection tools in the beef cattle industry are significantly associated with higher productivity and overall performance, including return on capital employed and sales growth. Moreover, their study pointed out that the difference between well-managed firms and poorly managed firms (well-managed firms use management tools, while poorly managed do not) were greatest in terms of productivity, profitability, growth rates and markets values (Bloom et al., 2005; Hersom et al., 2014).

If farms choose the appropriate management tools, they should be able to identify more accurate information about their animals, thereby increasing efficiency, profitability, and productivity. There are many management practices for the cow-calf farmers to use, such as record keeping and benchmarking.

This chapter provides an overview of two of the recommended management tools for the Canadian cow-calf industry, which are record keeping systems and benchmarking methods. Additionally, this chapter raises important questions about how ranchers (cow-calf producers) use those management tools to function and operate in the cow-calf industry. This thesis draws from strategic positions that contain production efficiency and marketing effectiveness along with managerial behavior, which includes market orientation and organizational learning. In

section 2.2, the use of record keeping systems is described and discussed. Section 2.2.1 discusses record keeping along with organizational learning. Benchmarking is defined and discussed in the section 2.3. Also, marketing effectiveness is discussed with benchmarking methods in this section. The rest of section 2.3 discusses organizational learning and market orientation in conjunction with benchmarking.

2.2 Record-keeping

Records generally show managers where the business has been and whether it is making profits or losses, and explained an increase or decrease in beef production. Farm records provide managers with information needed to measure how well the business is doing in terms of achieving their goals. Moreover, records provide managers with information necessary to assess the quality of past decisions as well as to enable managers to improve their future decision making. Specifically, farm records could be an excellent tool for assessing various activities and production levels of different animals within any operation (Yami, 2009). Managers need to maintain records to know if their business is performing well. Without adequate data collection and analysis of their operations, managers cannot properly decide on what actions should be taken to improve beef production and overall performance.

There are two basic categories for record systems: production records and financial records (Waters, 2012). These two systems can operate independently of each other to a point, but to be truly meaningful and useful, they should work together as part of the overall farm management program.

For cow-calf producers, a production record system should maintain the information related with the performance of the herd (on an individual female basis) and the production of

the land. Most production record systems take the information that is collected on a day-to-day basis and put it into a form or spread sheet that can be used for decision making (Saskatchewan Agriculture, 2015; Yami, 2009). Applying record keeping to beef production evaluation will allow a producer not only to look at what is currently taking place within the cow herd but, more importantly, to look at how management changes impact the performance of the herd (Bullock, Rensburg, Akers, & Smith, 1999; Saskatchewan Agriculture, 2015; Yami, 2009). Analysis of records can help to identify weak areas in the management program and aid in identifying individual animals that fail to perform at profitable levels (Bullock et al., 1999; Saskatchewan Agriculture, 2015; Yami, 2009). There are several steps in the cow-calf production system that should be recorded; breeding, pregnancy diagnose to calving, and weaning.

The first step for production records is to identify each individual animal, their age, sex, breed of both cows (female) and bulls (male) in the herd. Ear tags with a management ID number (birth order plus tattoo year letter are often used) are a popular and essential method to identify individual animals and track their individual records. For example, 10C would be the 10th calf born in the year 2015. Birthdate, sex of calf, age of dam are all used to adjust a calf's weaning weight to a 205-day weaning weight³, so accurate records lead to accurate adjusted weight calculations. Plus, 205-days adjusted weaning weights are very important for breeding decisions, which directly impact the performance of the herd, specifically, lbs of calf weaned. Also, recording the breed of the cows may not be essential for all cow-calf producers, but the information definitely helps in other stages of the beef supply chain, for example: breeding specific brands like certified Angus. Moreover, Pregnancy testing helps to determine whether

³ 205-day weaning weight = [(age of dam adjusted weaning weight – age of dam adjusted birth weight) / age of calf] x 205-day+ age of dam adjusted birth weight

Where: Age-of-dam adjusted birth weight = actual birth weight + adjustment factor

More information available at <http://edis.ifas.ufl.edu/an129>

pregnancy problems are occurring. For instance, if a large number of the females are pregnant at the time of the pregnancy test but do not calve, producers need to know which females need to be culled from the herd. Thus, producers could replace heifers, increase female longevity, and improve conception rate. This information could help cow-calf producers to reduce losses and increase their production efficiency. Furthermore, recording weaning weight is very important; it is needed to calculate feed rations, proper dosages of medication, mineral requirements, etc (Larson, 2015). Also, weight should be recorded at various times: birth, weaning, one year, annually, etc. Ultimately, producers are paid on lbs of calf weaned. Weaning weight can be used to assess which females are under and over performing (Larson, 2015). Thus, the more accurate information producers record the more costs they can save.

As much as production records are essential in evaluating the performance of the cow herd and in making decisions to improve profitability, incorporating financial records is equally important.

The most important reason for keeping financial records, such as balance sheets and income statements, is to have useful information when making management decisions. While some producers only keep the records necessary to file taxes, this information can be used to analyze and improve the overall profitability of the farm business. When cow-calf producers know their unit cost of production for each enterprise, they can make informed decision on whether or not to expand. Of course this also depends on a producer's goals for their operations.

2.2.1 Record keeping and Organizational Learning

Definition of record keeping is the process of collecting and saving data so that it can be analyzed and used in decision-making, thus, turning data into information and information into

actions. Actual farm data and market information helps producers identify their more productive animals thereby enabling them to become more efficient and profitable. Therefore, information is data that is processed in a way that makes it useful.

Record-keeping methods and organizational learning may be partly related.

Organizational learning has been discussed as adaptive behavior (Senge, 1990). Organizational learning can be seen as a continuing, cumulative gaining of knowledge and information, which is recognized as potentially helpful and useful to a company (Scott, 2011). Thus, learning occurs when a firm acquires information and knowledge (Huber, 1991). Huber (1991) suggests that learning occurs not only due to knowledge acquisition from outside of the industry, but also because of rearrangement of existing knowledge and the revision of previous knowledge inside of the business. If this is the case, learning oriented firms can compare and contrast their past and current information to improve productivity and performance (Scott, 2011).

Clearly, learning is an important tool for business, and managing or capturing internal information is one of the key ways for a firm to maintain and even improve their business. Detailed internal records offer managers meaningful and useful information, which can help maintain or improve productivity, as well as reduce costs. For example, the information cow-calf producers gain by tracking changes in recorded production data will enable producers to make advances in the management of their herd to increase productivity. Therefore, learning-oriented firms who keep appropriate records need to look at their own business and learn from their experience to build internal information and knowledge that can be used to justify operations, improve productivity and make accurate decisions in order to be competitive and sustainable.

Having accurate individual records is useful when producers make decisions. In other words, decisions based on actual observations are better guides for making future production

plans. For instance, keeping track of individual animal records is very important for cow-calf producers because records on an individual (per female) basis can help producers identify the top performing females in their herd. If producers only analyze on a herd level, they cannot identify the top and bottom performers. Moreover, collecting weaning weights is important for a producer to evaluate the overall productivity of the calf's dam.

However, some cow-calf producers do not collect data at all, and therefore have difficulty identifying problem areas which can be costly. Some producers even make decisions based on estimates, which can lead to a large margin for error (Larson, 2012). For example, a record of calving dates can be useful when selecting replacement heifers. Usually, females that calve earliest in the calving season are often the most fertile and productive within the herd, and producer can identify them based on a record of calving date (Larson, 2015). Moreover, a cow-calf producer needs to record feed costs. Specifically, when feed rations require usage of high-cost inputs (e.g. feed supplements), it could directly affect expense level and overall performance. Vasconcelos (2008) found out that knowing the current cost of production is essential for making timely marketing decisions and decreasing feed costs. Thus, good production and financial records are essential to monitor production and can help producers become more efficient, save costs, and increase profitability.

Organizational learning, on the other hand, is based on analyzing information and knowledge for a purpose, and learning from the process and the outcome (Zairi, 1999). This links record keeping to organizational learning as a managerial tool that can initiate and facilitate learning processes in the firm. It also implies a useful improvement to productivity and overall performance. Learning oriented farmers may be more likely to adopt record keeping. In other words, one of the ways to manifest a learning orientation may be through record keeping analysis

as it enables learning-oriented firms to continuously learn, create, retain and transfer information and knowledge in order to improve productivity and performance (Argote & Miron-spektor, 2009).

Data needs to be collected on a consistent basis over time so meaningful comparisons can be made, and those data must be evaluated so that managers can make sound management decisions (Alberta Agriculture and Forestry Policy and Environment, 2011; Saskatchewan Forage Council, 2011). A record keeping system can allow the producer to measure production processes and changes in management (Alberta Agriculture and Forestry Policy and Environment, 2011). For example, weaning weight can be increased by buying a bull who has a higher expected progeny difference (EPD) for weaning weight. The use of EPDs is essential for beef operations to compete in today's beef market. Specifically, a bull with an EPD weaning weight of 10 lb. would produce progeny that should average 10 lb. or even more at 205 days of age than the progeny of a bull with an EPD for a weaning weight of 0.0 lb. However, the way to truly assess management decisions is to have production records pre and post changes. A good record system can help producers make a change in management without guessing the cause of poor performance. Consequently, the farmers who have appropriate records should become more efficient and profitable. Therefore, collecting good (i.e., complete, simple, needful and accurate) data is significant and is the key step for farmers to have the information to understand farm performance better.

2.2.2 Record Keeping with Strategic Positioning (Productivity Gaps)

Strategic positioning reflects choices a business makes about the kind of value it will create and how that value will be created differently than rivals (Goldsmith & Gow, 2005). A firm typically

focuses on two areas to improve performance: efficiency and product differentiation (Porter, 1980). According to Goldsmith & Gow (2005), increasing efficiency has been used extensively in commercial agriculture in the past. Efficiency could identify productivity (performance) gaps, which focuses on current practices, processes, products, and markets (Goldsmith & Gow, 2005; Prahalad, 1993). In other words, when a firm learns its own practices, processes and routines, the improvement of productivity can be achieved. Furthermore, Goldsmith & Gow (2005) point out that if a market is fully competitive or mature, a firm most likely focuses on productivity in order to achieve success. It means if preferences remain unchanged and stable, firms are able to invest in assets corresponding to long production runs, lowering marginal costs and increasing the value of their products (Goldsmith & Gow, 2005).

The cow-calf industry has a long history in Canada with many producers across the country. Because the cow-calf industry is a competitive market, farmers cannot affect either the prices paid for resources or the prices received for products sold⁴; therefore, prices are exogenous. Therefore, cow-calf producers commonly focus on productivity; specifically, improving production efficiency and minimizing costs in order to increase profitability.

⁴ Currently, there are few online marketplaces. For example, AgriClear allows cattle producers (sellers) to negotiate price. More information visit: <https://agriclear.com/why-agriclear/>

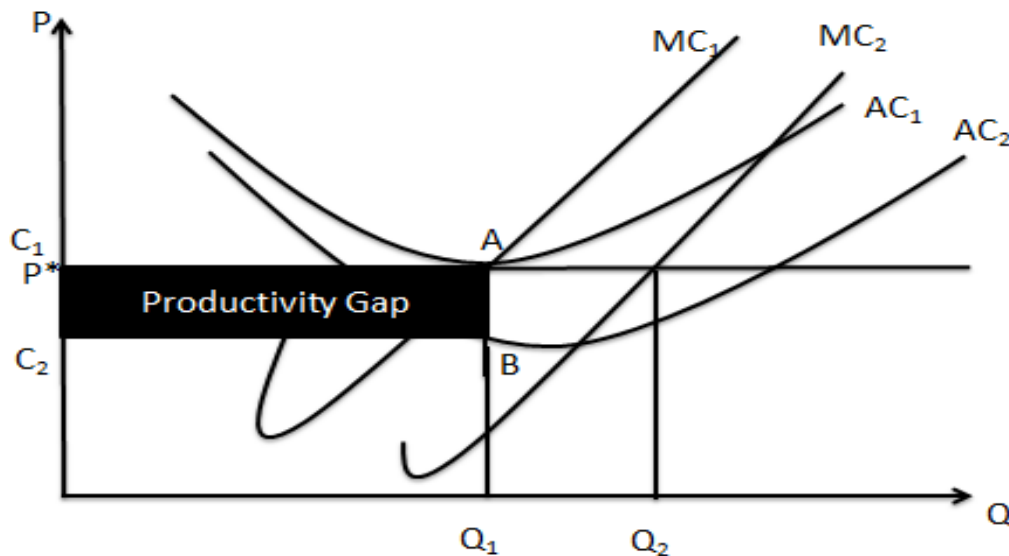


Figure 2.1 Efficiency of the firm (Productivity Gap)

Source: Porter, 1980

As shown in Figure 2.1, at cost C_1 a farm produces a quantity Q_1 , indicating it is operating at a loss, where C_1 is greater than P^* . If a gap is identified through the record keeping analysis of the farm's operations, this producer has incentive to change or improve the efficiency and production of the business. Then, the farmer's marginal cost shifts to MC_2 , and the average cost curve shifts to AC_2 . As a result, the farmer increases output from Q_1 to Q_2 , and earns a positive economic profit in the short-run. In the long run, new firms will enter the market and decrease the market price until it (P^*) equals the minimum average cost. Thus, the long run equilibrium occurs when $P=AC=MC$. The shaded area ($P^*-B-D-C_2$) represents the productivity gap. Once the shaded area is identified, firm's production efficiency could improve by minimizing costs.

Records capture past production and market information to better understand the drivers of farm performance. For example, cow-calf production and cost information generated from farm records provide an account of what has been achieved by the farm business. Sound

economic decisions are been made based on what farmers can measure and identify as not profitable. Accurate evaluation of all processes and reevaluation of current practices is the way progress can be achieved for an individual cow-calf farmer, and because of this, good records are important to maximizing productivity and increasing economic performance (Viloria Carrillo, 2010; Waters, 2012).

Managing information and productivity of these knowledge resources is complex but extremely important for strategic positioning (Goldsmith & Gow, 2005). This concept can clearly explain why some firms succeed in dynamic markets (Goldsmith & Gow, 2005). As stated by different researchers (Goldsmith & Gow, 2005; Porter, 1980; Prahalad, 1993; Rumelt, 1982), strategic positioning increasingly has been considered as a key element for increased performance. Both strategic positioning and record keeping involve knowledge and information about markets, and analysis and use of this knowledge is very important to the producers' business to attain efficiency and profitability in performance.

Record keeping is an internal evaluation of past results to determine ways to improve performance with comparisons being made between animals and between years. After analyzing the data, producers could identify weaknesses and opportunities, which would lead to initiation of improvements and corrections. However, the solution for farmers sometimes is beyond their range of ability. When cow-calf producers deal with uncertainty and challenges such as: weather, disease, reproductive failures, and buyer preferences, consultants and extension practitioners can help these producers alleviate some of the uncertainty by utilization of benchmarking for rancher`s self-assessment. One of the most popular suggestions from the extension practitioners is to utilize benchmarking (Larson, 2015; Ringwall, 2015; Western Beef Development Centre, 2015).

2.3 Benchmarking

Definition of benchmarking is the process of determining who is the very best, who sets the standard, and what that standard is. Benchmarking involves comparing the performance of a farm business with the performance of other farms that have similar enterprises (Alberta Agriculture and Forestry Policy and Environment, 2011). Benchmarking involves collecting data to generate production and/or performance averages for managers and producers to compare themselves against competitors and identify strengths and weaknesses in their operation in order to improve performance (Voss, Åhlström, & Blackmon, 1997).

The benchmark may be a competing producer or simply a successful one who is ready to share his/her good farm management practices with other producers in the area. In the cow-calf industry, the benchmark could be an average of numerous operations. For instance, the Western Beef Development Centre (WBDC), through the Western Canadian Cow-Calf Survey (WCCCS), calculates typical performance of beef cattle herds. Similarly, in the US, the North Dakota State University (NDSU) Extension Service calculates the average of performance of beef cattle herds by utilizing the Cow Herd Appraisal of Performance Software (CHAPS). The *“benchmark can serve as a demonstration of how things should be done. It can be studied, learned from and copied”* (Kahan, 2010).

Furthermore, benchmarking can be formal or informal (Kahan, 2010). Farmers use informal benchmarking relatively often (Kahan, 2010). For instance, if a producer hears about a peer farmer who improved beef production by adopting a new management tool, this producer most likely will want to learn more about this and improve his own production performance. This can be considered as a part of informal benchmarking.

2.3.1 Benchmarking with Productivity Gap

Even though informal benchmarking can help improve performance, to be efficient, managers need a formal, more structured and systematic approach (Elmuti & Kathawala, 1997). Formal benchmarking provides an authoritative standard from governmental surveys or an organization for comparison. Benchmarking is a management tool that is being applied in almost every industry. In a cow-calf operation, benchmark analysis, comparing one's own detailed financial or production indicators, is the critical step in identifying operational strengths and weaknesses. Typically, utilizing a benchmarking process as a within-year comparison focuses on costing, production and financial criteria by the producers, the local peers in each province, and even the whole cow-calf industry (Alberta Agriculture and Forestry Policy and Environment, 2011). Farmers can use information from third parties and government to evaluate or benchmark against their own production costs.

For example, the Western Beef Development Centre (WBDC) is an organization that focuses on management and economic factors affecting cow-calf production, and it provides the cow-calf sector with detailed information. Specifically, WBDC published Saskatchewan cow-calf cost of production benchmarks annually between 2001 and 2012⁵. If a producer's cost per lb of calf weaned is higher than the WBDC's reported benchmark, this producer could seek to lower their costs in order to improve their beef production and performance. Thus, accurately comparing costs and production could provide an opportunity for a producer to identify productivity gaps and make management changes to reduce the gap between him/herself and the benchmark. In other words, cow-calf producers can compare their own data with WBDC's cow-

⁵ Cost of production Survey was not completed from 2006 to 2008. The annual survey has ceased as of 2012.

calf cost of production (COP) benchmarks (as a basic cost) to manage their business more effectively.

The WBDC also publishes cow-calf cost of production (COP) benchmarks on the top 25% of producers in the study. This could be more valuable than average benchmarks because operations will want to strive to compare with top performers rather than the average.

2.3.2 Benchmarking with Organizational Learning

Research on organizational learning has contributed significantly to the development of organizational theory and change in strategic management. The key characteristic of successful organization is continuous learning (Senge, 1990). In this thesis learning is defined as a process that involves experience, practice and insight and can occur through observing the actions of other farmers and their consequences. According to Senge (1990), organizational learning can be described as an organization that enlarges its capacity to achieve the expected outcomes.

Benchmarking is a learning tool which assists in achieving constant improvement (Kelessidis, 2000). Benchmarking does not require imitation and merely looks at outcome, but it can be conducive to imitating and learning. Pemberton, Stonehouse, & Yarrow (2001) pointed out that utilizing benchmarking in an organization can enable evaluation its performance in relation to competitors. Also, learning from experienced firms can improve best practice leading to performance improvement. In other words, benchmarking can improve the capacity and speed of learning. Therefore, producers can learn and follow the practices of successful farms and avoid the practices of unsuccessful ones via benchmarking.

Moreover, learning, information sharing, and the adoption of best practices to improve farm performance are important to benchmarking. According to Kahan (2010), a strong social

dimension of benchmarking leads to more extensive change in farmer`s practices to reduce costs and increase production. In addition, a possibility to gain economical sustainability could impact different levels of learning. Collection and analysis of records, allows farmers to develop a better understanding of business management concepts and improve identification of factors that affect farms` productivity and overall performance. The idea of further learning results in the increased usage of networks of farmers, farmer organization and even peer advisory groups (Kahan, 2010), which eventually leads to learning orientation as an essential part of a farmer`s management practice. In other words, if farmers want to be successful, they need to continuously rethink and improve their decisions with the purpose of improving productivity and performance.

Furthermore, Sinkula (1994) and Slater & Narver (1995) both have pointed out that market orientation will be substantially more effective with the help of organizational learning. Within competitive environments like the cow-calf sector, continuous learning is a key. Cow-calf producers should research what the cattle buyers` (e.g. backgrounders, feedlot owners) want, as well as explore what capabilities are needed to compete with the competitors. As discussed in Chapter 1, there are many producers in the cow-calf industry, so producers are price takers. For cow-calf producers, this could mean seeking information outside of the firm and learning from external sources through benchmarking. Thus, benchmarking is an essential part of organizational learning, which can be conducive to market orientation strategy.

2.3.3 Benchmarking and Market Orientation

As discussed in the previous section, benchmarking is a way to support continuous learning and to promote organizations to higher competitive levels (Zairi, 1999). Once benchmarking is applied to identify farmers` potential problems, uncovering information from similar firms in the

industry, performance can be improved with the direct effect of achieving higher levels of buyers' satisfaction (Zairi, 1999). As a result, farmers overall performance can also be enhanced. Market orientation for cow-calf producers will increase the awareness about market by predicting present and future needs of buyers or customers, and dissemination of this insight within farms' management can produce an extensive reaction towards it (Micheels & Gow, 2014). If this is the case, the construct of market orientation can be applied. In other words, benchmarking does not directly lead to increased performance, but it can be conducive for being or becoming a market oriented firm.

If a firm adopts and implements a strategy to understand a buyers or customers' needs and demands, it suggests that the firm is market-oriented and has a competitive advantage to create superior performances for the firm (Ghorbani, Dalvi, & Hirmanpour, 2014). Based on Jaworski & Kohli's (1993) theory, a market oriented farmer, specifically customer oriented cow-calf producers, learn and search for information about buyers (e.g. feedlot owners or local/regional market) and their perceptions, and takes actions based on that information to ensure superior performance. Typically, cow-calf producers decide which cattle to produce based on market price. Market oriented producers will make decisions based on the feedlot buyers' needs. For example, cattle health is a top priority for feedlot owners, so a market oriented cow-calf producer will vaccinate to prevent disease. While vaccines are perceived by cow-calf producers as a variable cost, feedlot operations consider vaccination as an added value to calves. From the buyers' (feedlot owners) point of view, pre-vaccinated/pre-conditioned calves are beneficial because it decreases their cost and provides a healthy calf to them. Preconditioning programs contain a number of management practices on the ranch to enhance the health and nutrition of calves, so preconditioning adds value to calves for buyers. When preconditioned

calves are ready to sell on a market and the buyer recognizes the value that has been added, cow-calf producers could benefit from the higher prices. For market oriented cow-calf producers, this could mean pre-conditioned calves may bring a premium price to achieve their maximum value in the long run.

Moreover, high level market oriented firms not only understand the importance of meeting buyers' needs, but also the needs of the rest of the supply chain such as feedlot owners, packers, and consumers. This could mean higher level market oriented cow-calf producers' care about the feedlot owners' requirements, backgrounders' needs and even consumers' satisfaction. For instance, muscling, marbling and maturity are the different factors to evaluate beef quality grade. Carcass quality is a highly heritable trait which means the cow-calf producers can make animal selections to improve carcass quality or grade. Market oriented producers will strive to produce animals that can grade Prime and AAA with high yields (Y1), which can improve their business performance as well as create value for supply chain partners.

2.3.4 Benchmarking with Opportunity Gap

Another concept of strategic positioning is product differentiation, which is to distinguish a product from similar offerings in the same market (Goldsmith & Gow, 2005; Porter, 1980; Prahalad, 1993; Rumelt, 1982). For small firms, product differentiation "is an adaptive strategy for value creation in response to acute changes in a firm's competitive environment" (Porter, 1980). When a firm uses a product differentiation strategy that focuses on the quality attributes of the products that create the awareness that other producers do not have or buyers view the product is unique, thereby gaining an advantage in the market. This concept can explain why some firms succeed in competitive markets while others suffer (Goldsmith & Gow, 2005).

Agriculture markets have become dynamic, and buyers' preferences are changing almost every day, markets have now become even more difficult to define (Brocklebank et al., 2008). Because of these reasons, product or production-based strategies have become less effective particularly within the livestock sector and the cow-calf industry. The opportunity gap strategy needs more attention in current markets. Originally, Prahalad (1993) states the opportunity gap strategy as a sense of broad strategic direction or to create new markets or even new businesses. In this situation, cow-calf producers meeting with buyers may help identify opportunity gaps.

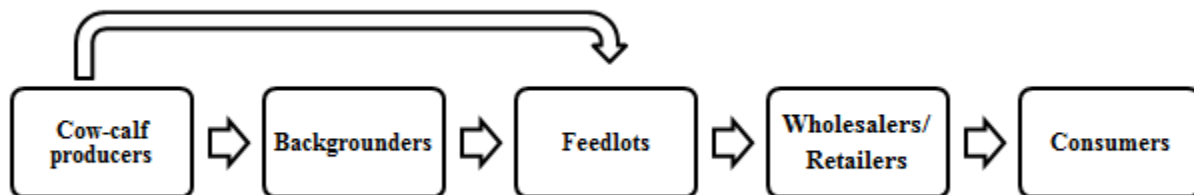


Figure 2.2 Beef Supply Chain

Source: Brocklebank et al., (2008)

Commonly, only cow-calf producers maintain a breeding herd of cows, and commercial producers typically sell calves in one of three ways: live auction, internet auction, or directly to backgrounder or feedlot owners. As shown in Figure 2.2, cow-calf producers are the start of the supply chain, and because they are paid on the basis of weight they have a tendency to pay no attention to consumers' needs. Cow-calf producers strive to provide beef for channel partners at a competitive price while sustaining and improving resources under their care. In order to achieve this goal, focusing on the discovering of opportunity gaps may enable producers to better meet consumer demand.

To summarize, record keeping and analysis is significant on many different levels and can help improve the productivity of an operation to levels higher than those who operate without information (Kay et al., 2011). Hence, good records should help cow-calf

managers/producers to answer operational questions, and effective management will depend on accurate measurement of production and financial information/data. On the other hand, Benchmarking is an important tool to evaluate the competitiveness of a particular operation, and to allow for the comparison to others in the cow-calf industry. This also allows for management decisions and plans based on good data. Thus, record keeping and benchmarking are both essential in evaluating production performance and in making informed management decisions. More specifically, keeping good records of farm activities should ease the usage and accuracy of benchmarking (Kahan, 2010). Therefore, with proper record keeping and benchmarking, managers or farmers can easily and quickly identify problems before they have a serious impact on the business.

2.4 Summary

Previously published studies have included factors that have attempted to explain, to some extent, observed differences in farmer technology adoption, farm management, and performance. However, the representation of the management tools such as record keeping and benchmarking, managerial factors, and structural factors, with some exceptions, have been very limited in the Canadian cow-calf sector. Therefore, this thesis includes all above factors, which should lead to better representation and explanation for cow-calf producers to improve their business.

This chapter provides the literature review upon which this thesis is based. The theory on strategic positioning (increasing efficiency and product differentiation) was explained through different studies. Then, this chapter provides information and reasons on why record keeping and benchmarking are important for cow-calf producers, and what factors may influence cow-calf producers to use these management tools, which can affect overall performance. Managerial

factors were stressed in the form of market orientation and learning orientation. Next, Chapter 3 provides the theoretical framework and hypotheses that can help to identify the influence of market orientation and learning orientation constructs and management practice tools on beef production.

Chapter 3: Theoretical Framework

3.1 Introduction

This chapter develops a theoretical framework collected from the relevant literature and insights from the Canadian cow-calf industry. The process of developing the theoretical framework begins with an examination of incentives facing an individual farmer choosing recommended management practice tools (record keeping and benchmarking). The theoretical approach expands on Goldsmith & Gow's (2005) strategic positioning framework to model the factors influencing a farmer's decision-making process. In order to understand the reasons for assessing the impact of adopting record keeping and benchmarking, this framework also involves the managerial factors which may lead to their use, namely market orientation and organizational learning. This chapter will build appropriate hypotheses based on the relevant literature, and the following chapter will examine those hypotheses.

The first section of the chapter briefly explains the theories of strategic positioning. Then, the productivity gaps and opportunity gaps as key factors of adopting recommended management practice are described. After that a discussion of the theories on market orientation and organizational learning along with recommended management practice tools is also provided. This chapter concludes with a discussion of how these practice tools can help cow-calf producers to improve performance.

3.2 Strategic Positioning

Traditional economic theory assumes that firms want to improve performance, which is assumed to mean that those firms strive to maximize profits. Jensen (2002) noted that firms should maximize profit, which can lead to an economically efficient outcome. In the agricultural sector,

owners and managers frequently make decisions by adopting more efficient management tools, employing more profitable ways of production, and increasing performance. According to Elam & Preston (2004), productivity of the U.S beef herd has increased around 80% over the past 50 years. Much of the increase in productivity can be attributed to the development and utilization of management tools to affect productivity of beef operations and adaption of technologies to improve beef production (Elam & Preston, 2004; Hersom et al., 2014). Thus, becoming more efficient and being more profitable is crucial for any business. Within the Canadian livestock industry, specifically the cow-calf sector, many firms want to lower production costs, to be more efficient as well as increase returns. In order to do so, adopting appropriate management tools could be an important method for improving production efficiency and minimizing costs. In addition, continuous learning of relevant information, adopting beneficial skills, training employees, and determining buyers' needs as well as improving buyers' satisfaction are the key factors for future success (Kohli & Jaworski, 1990; Sinkula, 1994). In other words, the concepts of market orientation, organizational learning and strategic positioning would be valuable resources in achieving superior performance.

Goldsmith & Gow (2005) stated that increasing performance could be accomplished by focusing on both the productivity gap and opportunity gap. In one respect, producers may focus on narrowing the productivity gap and try improving performance across a variety of measurements such as quality, cost and productivity (Goldsmith & Gow, 2005). In such a case, the use of benchmarking may help cow-calf producers reduce the productivity gap after comparing with posted benchmarks. Thus, cow-calf producers might mainly invest in fixed production and marketing assets since the cow-calf industry is a relatively static and competitive market; therefore, closing the productivity gap is an important option for raising the farm's

efficiency and profit.

On the other hand, managing the opportunity gap should be considered as well. Profitably utilizing resources to create new markets, new business and new products, is the process of distinguishing a product or service from others, to make it more attractive to buyers. It is also called product differentiation (Porter, 1980). It can lead a firm to an advantageous position. The Canadian cow-calf industry is a competitive industry (Larson, 2012), so being an efficient producer is important to success (Goldsmith & Gow, 2005). In other words, producers need to be open-minded enough to navigate changing and evolving market opportunities. Open-mindedness provides a platform on which operators can build one idea on top of another, correct mistakes and create new ideas, which Day (1994) considers essential to organizational learning. In a recent study, Boyatzis, Rochford, & Taylor (2015) also found that open-mindedness has a significant and positive effect on organizational learning. Thus, there is an evidence link to organizational learning and exploring and exploiting opportunity gaps.

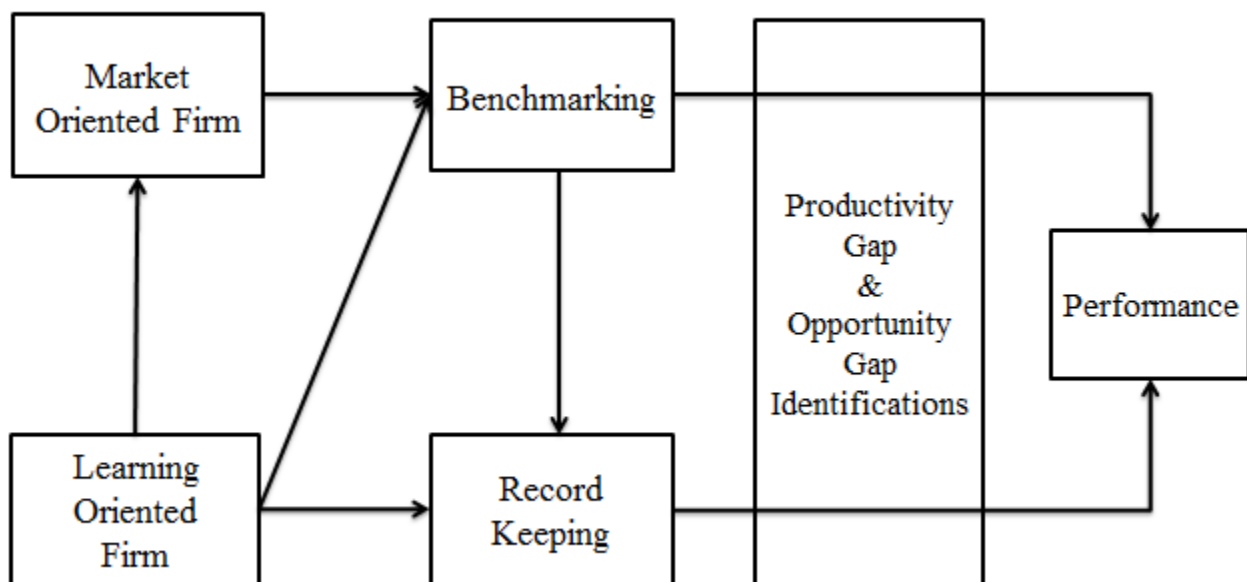


Figure 3.1: A Conceptual Framework and Hypotheses

The conceptual model underlying this thesis is shown in Figure 3.1. This thesis takes into account two management practice tools (record keeping and benchmarking) in order to assist cow-calf producers to become more efficient, increase beef production, and be more profitable. This model shows the connection between adopting recommended management tools, specifically record keeping and benchmarking, market orientation, organizational learning and performance. Figure 3.1 highlights four different subjects: productivity gaps, opportunity gaps, market orientation and organizational learning have both direct and indirect effects on adopting record keeping and benchmarking in order to achieve superior performance.

3.3 Market Orientation and Productivity Gap

In the past few decades, cow-calf producers normally focus on beef production efficiency or narrowing the productivity gap in order to perform well relative to their competitors. Several studies have found that cow-calf cost of production, production output, and profits were influenced by cowherd size, land investment, livestock investment, and machinery and equipment investment, which have been found to be important in determining economic performance (Ramsey et al., 2005; Ward, Vestal, Doye, & Lalman, 2008). Also, Ramsey et al. (2005) pointed out that each of those factors has affected production and production efficiency.

As discussed in the Chapter 2, in order to improve beef production efficiency and thereby overall performance, producers should identify a way to understand buyers' needs and other producers' operations. In terms of determining firm performance, Narver & Slater (1990) measured market orientation based on the three organizational behavioral components (customer orientation, competitor orientation, and inter-functional coordination). Understanding a firm's target buyers, their potential competitors' short-term strengths and weaknesses as well as long-

term capabilities and strategies is important for this firm to continuously create superior value (Narver & Slater, 1990).

In North America, most calves are either sold through live auction including electronic and video sales or directly to feedlot operations through contracts or order buyers (Larson, 2015; Penny State Extension, 2013). This implies that price is the main conduit for the transmission of market information to buyers and sellers. In other words, besides price, there is a little interaction between buyers and sellers. Obviously, this makes it more difficult to understand buyers' needs and satisfaction.

However, market-oriented firms can receive formal and informal feedback or information from competitors as well (Kohli & Jaworski, 1990). Balakrishnan (1996) also states that a competitive orientation helps a firm to create a value to the products and services by learning from competitors within the industry. For instance, weaning weight is an important factor to reflect how well cow-calf producers perform. If a producer's calf lbs. weaned per cow exposed is lower than others, this producer should compare their data from other firms or a representative benchmark in order to understand competitors' strategies as well as improving his/her performance and competitiveness. Comparing oneself to others is also called benchmarking. In this case, benchmarking is external information which helps the producer to identify the areas where performance can be improved. In other words, benchmarking can lead to a greater understanding of practices needed to improve performance by continuously comparing, identifying and adopting appropriate practices found inside and outside of the industry (Elmuti & Kathawala, 1997).

A competitor orientation is an important component for market orientation (Narver & Slater, 1990). Based on previous marketing literature (Sørensen, 2009; Zhou, Yim, & Tse, 2005),

competitor orientation has a positive influence on business performance (Day, 1994; Sørensen, 2009). If a firm keeps up to date with information about its competitors' offerings and moves, it could help to maintain competitive positions as well as sustained profitability in the market. The comparison of the production information between similar businesses is a key tool to identifying best practice. In another similar study, Elmuti & Kathawala (1997) also pointed out benchmarking can be defined as the search for industry best practices that lead to superior performance. Voss, Åhlström, & Blackmon (1997) showed the use of benchmarking has a positive relationship with performance, but it did not explain whether benchmarking leads to better performance, or whether better performing companies use benchmarking more. It has been argued a firm that use benchmarking will have improved performance (Elmuti & Kathawala, 1997; Voss et al., 1997), but if a producer does not have accurate or good information about their own farm (record keeping), benchmarking is difficult to do as one needs comparable numbers.

When internal information and external information become available, it can help a producer to become more efficient and profitable, thereby increasing performance. In other words, it is a good practice to keep detailed production records of farm activities, which will make benchmarking possible. Record keeping is a tool to collect internal information. Information and knowledge are important inputs for decision making, and it is necessary to understand how data is gathered and evaluated and the relevance of the knowledge and information (Viloria Carrillo, 2010). In agricultural businesses, managers face many different types of informational needs and sources. Production records are considered internal information that can give managers and farmers a detailed picture of their current production circumstances.

A farm's detailed information and knowledge can help to improve production and herd performance. There are a number of useful production indicators, including conception rate,

calving span, calving distribution, and calving interval that can be calculated from production records. A typical target for conception rate is 95 percent (i.e., number of females pregnant/number of females exposed to breeding) (Alberta Agriculture and Rural Development & Western Forage Beef Group, 1998). Calving span, length of calving season in days, should be 60 to 80 days for efficient use of labour and a more uniform calf crop (Alberta Agriculture and Rural Development & Western Forage Beef Group, 1998). The accepted target for calving distribution is to have at least 60% of females calving in the first 21 days of the calving season (Larson, 2015). Calving interval is the amount of time between calving dates, and ideally it is 365 days or less (Larson, 2015). Tomaszewski, Van Asseldonk, Dijkhuizen, & Huirne (2000) examined the relationships between the use of individual cow production records and performance in Dutch dairy farms from 1987 to 1996. They found that the use of detailed and accurate records resulted in farmers increasing herd average milk produced annually and protein production by 62 and 2.36 kg per cow, respectively; also, calving interval was shortened by 5 days. Therefore, having good records allows for analysis which can lead to improved production and performance. Several similar empirical results also showed how internal information positively influences performance in Venezuela hog farms (Viloria Carrillo, 2010) and Finnish dairy farms (Mäkinen, 2013). Therefore, it is formally proposed:

- **Hypothesis 1a:** An increase in the market orientation of the firm will lead to an increase in record keeping and benchmarking.
- **Hypothesis 1b:** firms that adopt record keeping will have increased beef production and above average performance.

3.4 Organizational Learning and Productivity Gap

Analysis of productivity gaps has a close relationship to the stability of market structures (Goldsmith & Gow, 2005). Thus, this strategy focuses on enhancing the quality of products to achieve superior performance as well as maintain a competitive advantage within the same market. Likewise, organizational learning is concerned with developing new managerial knowledge to improve organizational performance (Stonehouse & Pemberton, 1999). If learning is appropriately managed, firms should create superior performance (Pemberton et al., 2001; Stonehouse & Pemberton, 1999). On another respect, Manasco (1996) pointed out that organizational learning is concerned with the strategies and processes of identifying and capturing such knowledge to improve competitiveness. Thus, firms attempt to learn more quickly than their competitors in order to increase their competitiveness. In order to do so, record keeping analysis should be an appropriate management practice tool. Precisely, through collection and analysis of records, producers can learn from themselves to better understand their operation, evaluate business's growth, understand financial needs, improve decision making, and finally achieve higher performance. Therefore, the level of learning provides the foundation of organizational learning that affects how useful record keeping is on a firm's performance.

The process of organizational learning is complicated. Learning can be based upon experience, analysis, and experimentation. Senge (1990) differentiates between two types of organizational learning: adaptive learning and generative learning. Focusing on productivity gaps most likely stems from adaptive learning, which emphasizes change in response to developments in the business environment. Adaptive learning involves using knowledge to solve specific problems based on existing assumptions, and often based on solutions that have worked in the

past (Senge, 1990). In other words, adaptive learning is adequate to motivate strategic adjustments to operations, production, and planning. In a similar way, benchmarking refers basically to the process of evaluating and applying best practices that provides possibilities to improve the quality of products and services (Pemberton et al., 2001; Stonehouse & Pemberton, 1999). The purpose of benchmarking is to look at how well an individual firm is doing compared to others in the same field/industry or a representative benchmark, and to learn from them in order to improve his or her own business. For example, talking or hearing about another cow-calf producer's operation and their innovative practices or performance can change one's beliefs that that there might be a better way to compete. The central core of benchmarking is learning where to improve activities, processes and management (Kyrö, 2003). Use of benchmarking can attempt to emulate the practice of successful organizations, and this could correspond purely to adaptive learning so as to improve firm performance.

Several researchers have examined these relationships in various contexts. Zairi (1999), for example, discusses many of these characteristics in relation to benchmarking and organizational learning. Griego, Geroy, & Wright (2000) also state that educational training designed to enhance job performance is a key element of organizational learning. Pemberton et al. (2001) conclude that benchmarking is most likely to deliver significantly improved organizational performance when it is connected with organizational learning. In livestock industry, an important part of benchmarking has been based on the comparative analysis of physical and financial records of ranchers. For example, Verissimo & Woodford (2005) studied the cattle and sheep industry in New Zealand and pointed out that all top performing producers were benchmarking their data compared to other high-performing producers. Moreover, these top producers spent at least one hour per day reading and learning relevant information

(Verissimo & Woodford, 2005). It clearly shows that the learning process and benchmarking are important roles for a firm's performance. Based on the previous discussion (Pemberton et al., 2001; Verissimo & Woodford, 2005), therefore, the following is formally proposed:

- **Hypothesis 2a:** An increase in the organizational learning of the firm will lead to an increase record keeping and benchmarking.
- **Hypothesis 2b:** Firms that adopt benchmarking will have increased beef production and above average performance.

3.5 Opportunity Gap and Organizational Learning

Product differentiation is a strategy that creates new markets and new products for buyers (Goldsmith & Gow, 2005). This strategy could directly affect a firm's ability to challenge existing assumptions about themselves and how a firm should think "challenges status quo" and "outside of the box", which is called organizational learning (Sinkula, Baker, & Noordewier, 1997). In Figure 3.2, firms have fixed costs that must be paid in the long run. Thus, if a firm can cover its variable costs and still have revenue to contribute to its fixed costs, it loses less money by producing than by shutting down. In the long run, however, this firm will eventually shut down. Assuming that the cost for this firm is already minimized and the productivity gap does not lead to improved performance. If this firm still wants to operate the business, new markets or product differentiation are needed. For example, since 2013 *A&W Food Services of Canada*⁶ stated that all the beef products used in their patties will be produced without added hormones and steroids (A&W Food Services of Canada, 2015). With this decision and to satisfy this new market, beef producers could change current production practices if they are being properly

⁶ A&W Canada is a Canadian fast food restaurant chain and is owned by private holders. It is also the second largest burger chain in Canada. In 2014, they reported the sales of \$957,194,000. Additional information about A&W Canada <http://www.aw.ca/awhome.nsf/company/>

rewarded. In other words, producers can raise cattle without the use of hormones or antibiotics to meet the demand if A&W is willing to pay a premium price.

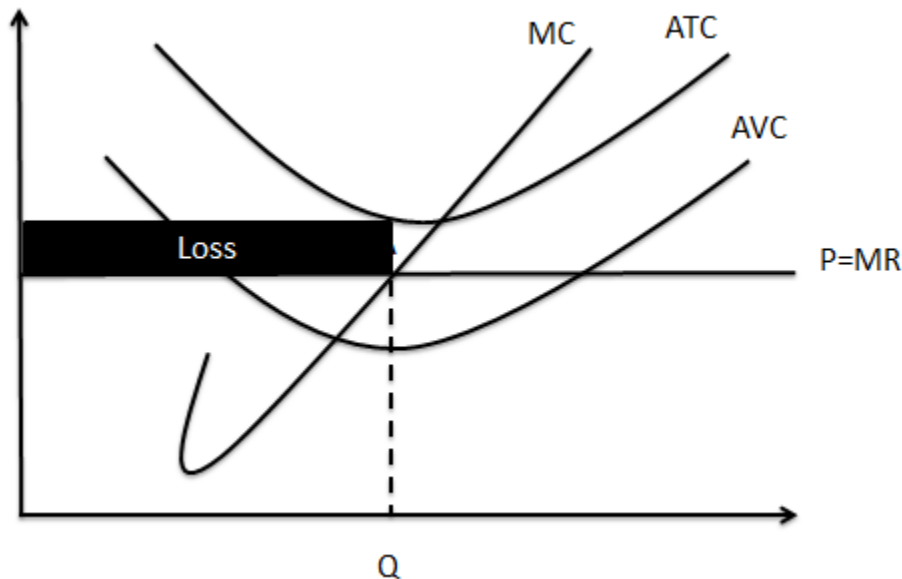


Figure 3.2 Production Loss in Long Run

Through organizational learning, the firm reorganizes current knowledge in the development of suitable products for buyers. If a firm is able to learn from their buyers faster than their competitors, they may have a competitive advantage in the marketplace (Slater & Narver, 1995). Learning is an important ability that leads to improved performance (Slater & Narver, 1995). Record keeping and benchmarking should also be linked to the broader concepts of the organizational learning (Senge, 1990). The theory of the organizational learning suggests that learning is necessary for a company to survive in an increasingly competitive environment (Baker & Sinkula, 2005; Day, 1994; Slater & Narver, 1995).

Furthermore, according to Senge (1990), generative learning is a way to develop or build new markets and products and ways of doing business to gain a competitive advantage.

Generative learning is higher order learning that is required for firms to unlearn current or

traditional market knowledge and replace it with this new information (Day, 1994; Senge, 1990). For example, Stonehouse & Pemberton (1999) examined the connections between the various forms of learning and found that a cognitive approach aimed at generative learning represents the most effective pattern for an organization striving for superior performance. In another study, Pemberton & Stonehouse (2000) pointed out that benchmarking should be used as a catalyst for reflection on current organizational processes and practices, and as a basis for creating new approaches based on new organizational knowledge. A producer operating in the cow-calf sector could “think outside of the industry” as a way to improve their performance. Commonly, most cow-calf producers want to raise the most profitable cattle. In order to do so, they could create special value or attributes in their cattle by preconditioning weaned calves, for instance. Preconditioning is a management method, where cow-calf producers retain their weaned calves provide fall vaccinations and get them adjusted to a feeding program. Weaning is a very stressful time for calves and by choosing to keep them through this stressful period rather than send them straight to market, the calves should be considered more valuable for buyers. Thus, preconditioning is intended to optimize the immune system and nutritional status of calves while minimizing stress as well as maintain healthy calves (Beef Cattle Research Council, 2014). Specifically, vaccinating before producers sell the calves to the feedlot owners, could lead to a premium price for producers or sellers. Therefore, the following is formally proposed:

- **Hypothesis 3a:** An increase in the organizational learning of the firm will lead to an increase in record keeping and benchmarking.
- **Hypothesis 3b:** Firms that adopt record keeping and benchmarking will have increased beef production and above average performance.

3.6 Chapter Summary

This chapter presented a theoretical framework and a conceptual model that proposed different theories related to the adoption of management practice tools, namely record keeping and benchmarking. These theories provide rationale for why adopting record keeping and benchmarking are important for cow-calf producers to increase performance and beef production efficiency. The hypotheses are described and explained on how they could influence the process and improve performance. The next Chapter will outline how the survey was conducted, the data collection method, and describes the methodology for testing stated hypotheses.

Chapter 4: Description of the Data and Econometric Model

4.1 Introduction

The objective of this chapter is to describe a unique data set and the econometric model used to answer the hypotheses proposed in Chapter 3. The first part of this chapter describes the data, including data collection and descriptive statistics of respondents. Second, the variables, including market orientation, organizational learning, management tools (record keeping and benchmarking), and control variables, are defined and explained. Finally, this chapter provides a discussion and explanation of factor analysis, binary logit models, and ordinary least squares models that are used to analyze the survey data along with why the econometric model chosen was the most appropriate for this thesis.

4.2 Description of Data

4.2.1 Data Collection

The data were collected from a survey of 110 cow-calf farms in three Prairie Provinces, Alberta, Saskatchewan, and Manitoba. The Western Canadian Cow-calf Management and Marketing Survey (can be viewed in Appendix) was designed by researchers from the department of the Agricultural and Resources Economics in the College of Agriculture and Bioresource, and distributed through the Western College of Veterinary Medicine⁷. The survey was sent out by both e-mail and paper copy.

Questions were designed to measure the extent cow-calf producers adopted or were using practices recommended by economic and livestock specialists. The questionnaire was also

⁷ This survey was part of a larger Beef Cattle Research Council funded 5 year study by the Western College of Veterinary Medicine (Dr. John Campbell, Principal Investigator). Started in Fall 2013, the study involves 110 producers across western Canada, providing various details about their operation. One component of the study involves up to four annual producer surveys; the Western Canadian Cow-Calf Management and Marketing Survey was one of the studies administered in June 2015.

designed to ask cow-calf producers for their responses on various latent constructs, including market orientation and organizational learning. Moreover, the questionnaire asked producers about management areas such as marketing, business planning, finance, farm record keeping and other management. Finally, questions were asked regarding demographics and farm characteristics. Before the survey was mailed, questions were reviewed and approved by University of Saskatchewan Research Ethics Board to confirm ethical standards⁸.

A mailing list was obtained from the Western College of Veterinary Medicine comprising names and addresses of 110 cow-calf producers in the Prairie Provinces. In addition, all the respondents were part of a larger research project led by Dr. John Campbell. Subsequently, the final total sample size is 67, which only includes fully completed surveys responses, so this resulted in an adjusted response rate of 61%. Based on previous studies, several reports pointed out that achieving a 50% response rate on the first round is good, and that second round response rate of about 70% should be considered average, respectively (Carley-Baxter et al., 2009). For the purposes of this study the response rate of 61% should be considered to be good.

4.2.2 Data Measures

Drawing from previous research, existing scales with demonstrated measurement properties were used to survey the producers on their level of market orientation (Narver & Slater, 1990) and learning orientation (Sinkula et al., 1997). “*Market orientation*” was hypothesized as one dimensional construct consisting of three components, customer orientation, competitor orientation and inter-functional coordination in the original study; however, only customer orientation and competitor orientation were employed in this thesis. Inter-functional coordination

⁸Approval was granted on June 11th, 2015 by the University of Saskatchewan’s Behavioural Ethics Board project.

was not included as it usually refers to the degree of cooperation between the different functions or departments within the firm (Narver & Slater, 1990), which is aimed at the internal environment. Since Canadian cow-calf producers generally are the owners of their business or work for their family business, the component of inter-functional coordination may not be as relevant in this study. In other words, most cow-calf producers in Canada manage and handle all their business transactions from buying feed to negotiating pasture rental arrangements to selling the cattle, so the inter-functional coordination is not a necessary component to assess in this case. Fourteen statements were developed from Narver & Slater (1990). With all the measures used in this study, the original scale was altered to fit with beef production; therefore, the meaning of the construct can still be maintained after minor adjustments (Micheels & Gow, 2008). Also, the items were adapted to the setting and to the structure of the survey, and some minor changes were made in order to keep the sentences short and simple. The market orientation items posed in the survey as shown in Table 4.2.3(a), were measured using a five-point Likert scale where 1 = Totally Disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Totally Agree.

Table 4.2.3 (a) Market Orientation: Customer Orientation and Competitor Orientation

-
1. We discuss information concerning competitors' (neighbours and other cattle producers) strategies.
 2. We are quick to respond to competitive actions that threaten our operation.
 3. We target buyers where we have, or can develop, a distinct advantage.
 4. We regularly discuss competitors' (in our case, it refers to neighbor and other cow-calf producers') strengths and strategies.
 5. We regularly visit current buyers to see how our cattle are meeting their needs.
 6. We discuss reasons for successful and unsuccessful buyer experiences on a regular basis.
 7. We coordinate all of our business functions (from buying to producing, selling and accounting) in order to better serve the needs of our target markets.
 8. We understand how everything in our operation can contribute to creating market value.
 9. The business objectives on our operation are driven by consumer (in our case, it refers to the feedlot owner buying a producer's cattle) satisfaction.
 10. We continually monitor our level of commitment to serving market demands.
 11. Our strategy to improve performance is based on our understanding of what the market wants.
 12. Our strategies are driven by our beliefs about how we can create greater value for our buyers.
 13. We measure buyer satisfaction regularly.
 14. We pay close attention to our buyer, even after our cattle are sold.
-

To measure learning orientation, 12 items were used based on Sinkula et al. (1997).

These items were posed to measure the learning ability of the cow-calf producer. The questionnaire contained questions on commitment to learning (6 items) and open-mindedness (6 items). These items were reworded to be more relevant for the cow-calf sector. The organizational learning constructs were also measured using a five-point Likert-scale where 1 = Totally Disagree and 5 = Totally Agree. See Table 4.2.3 (b) for the statements posed to assess organizational learning.

Table 4.2.3 (b) Organizational learning: Commitment to Learning and open-mindedness

1. We basically agree that our farm/ranch's ability to learn is the key to our competitive advantage.
 2. The basic values of this farm/ranch include learning as key to improvement.
 3. The sense around here is that learning is an investment, not an expense
 4. Learning on my farm/ranch is seen as a key commodity, necessary to guarantee survival.
 5. Our culture is one that does not make learning a top priority
 6. The collective wisdom on this farm/ranch is that once we quit learning, we endanger our future.
 7. We are not afraid to reflect critically on the beliefs and assumptions we have about the way we ranch/farm.
 8. Decision-makers on this farm/ranch do not want their "view of the world" to be questioned.
 9. Our farm/ranch places a high value on open-mindedness.
 10. All labourers on this farm/ranch – paid and unpaid - are encouraged to "think outside of the box."
 11. An emphasis on constant innovation is not a part of our farm/ranch's culture.
 12. Original ideas are highly valued on this farm/ranch.
-

Usually, performance is measured in terms of firm effectiveness, efficiency and product value (Tohidi, 2011). Thus, performance of the beef cow-calf can be measured in different ways, such as costs, production and profitability. In order to properly evaluate the economic efficiency of a business activity and product value, as well as, knowing that weaned calves are the primary unit of production, beef production is measured as total pounds of calf weaned (Larson, 2015). In general, cow-calf producers usually focus on increasing beef production efficiency, which means having higher conception rate and can lead to more calves born and more pounds available to be marketed (Larson, 2015). Therefore, performance was defined as beef production efficiency in this thesis and measured by total pounds of calf weaned divided by total number of females exposed.

4.2.4 Control Variables

Control variables were included in this thesis for classification purposes regarding firm and respondent characteristics, and to avoid model misspecification. Characteristics relevant for market orientation, learning orientation and adoption of tool and technologies have been discussed to a limited degree in the literature. Therefore, the characteristics measured in this study were developed in close discussion with professionals from the Canadian cow-calf industry. The following control variables have been included; the influencers in the decision-making process, winter feeding cost, income, age, experience, education level, herd size and goal setting.

The influencer in the decision-making process was measured by asking survey respondents to choose one of the following alternatives: (1) banker/accountant (2) paid consultants (3) veterinarian (4) ag-extension personnel (5) spouse. They were also free to state their business decisions in an open text section. *Winter Feeding cost* was measured by the individual's winter feeding days multiplied by the average winter feed cost per head per day. *Income* was measured by gross farm revenue in 2014 from the following intervals: (1) under \$ 100,000, (2) \$ 100,000 to \$ 249,999 (3) \$ 250,000 to \$ 399,999 (4) \$ 400,000 to \$ 549,999, and (5) above \$550,000. These intervals were specified partially based on the classification of low, medium and high cow-calf farms based on response from industry representatives and experts. *Age* was indicated by the year/age of cow-calf producers. *Experience* was measured as the number of years that the producer has been operating the cattle business. Respondents were asked to state their *education level*: (1) high school, (2) trade or technical school, (3) college degree (4) university degree, (5) Graduate or professional degree. *Herd size* was indicated by the number of cattle on the farm in 2014. Respondents were asked to state the number of cattle on

their operation in order to separate smaller operations from the large ones and to analyze the data by herd size. Respondents were asked to provide the number of females that calved in 2014, number of herd sires, number of backgrounders sold, number of replacements developed, number of grassers sold, and number of finished head sold. *Goal setting* was measured by asking “*Do you set production (financial) goals for your business?*” and respondents had a choice of answers either a “yes” or a “no”.

4.3 Method and Model

One of the purposes of this thesis is to test the hypothesized relationship between several independent and dependent variables along with underlying constructs, thus a factor analysis is appropriate (Yong & Pearce, 2013). Factor analysis was performed on these items to determine the validity and reliability of market orientation and organizational learning constructs. Moreover, this thesis aims to describe and evaluate whether record keeping analysis and benchmarking on Canadian cow-calf farms translates into increased efficiency, profitability and performance. Finally, the production model investigates the relationship between performance, specifically defined as the beef production efficiency, and the rest of the variables-market orientation, organizational learning, record keeping, benchmarking, and control variables is investigated.

In sum the models are, (1) adopted tool (record keeping and/or benchmarking) is a function of market orientation, learning orientation and a set of control variables; (2) performance is a function of market orientation, learning orientation, a set of control variables and two dummy variables (record keeping and benchmarking). A Binary Probit model is appropriate to estimate the effect of adoption of management practices tools in model 2. Four regressions are estimated in total for both models. One regression is estimated for model (1), and

three regressions are estimated for model (2). The data were analyzed using SPSS 22.0 and E-views 8 statistical programs. These programs were used to examine factor analysis, reliability, Ordinary Least Squares, and Binary Logit model to evaluate the relationships between the variables as well as the hypotheses proposed in Chapter 3.

More specifically, a two-step detailed statistical analysis of data was undertaken. First, factor analysis was performed to assess the underlying factor of market orientation and organizational learning. Second, the Binary Probit model and multiple regression analysis were performed to understand the relationship of market orientation, organizational learning, management practice tools and control variables and to investigate the impact of those relationships on business performance.

4.3.1 Factor Analysis Approach

One main goal of factor analysis is to explain the relationship between observed variables and the underlying latent factors (Harman, 1976). From the perspective of this study, the factor analysis is useful in examining how the construct of market orientation and organizational learning impact cow-calf producers to adopt record keeping and benchmarking since the construct of market orientation and learning organization are latent variables (indirectly measured).

Another purpose of this thesis is to use exploratory factor analysis, which is trying to find the suitable number of explainable factors that can efficiently explain the correlations among a set of variables (Yong & Pearce, 2013). Exploratory Factor Analysis is a useful tool for understanding the dimensionality of a set of variables as well as for separating variables that do

not represent the dimensions competently (Yong & Pearce, 2013). In other words, Exploratory Factor Analysis attempts to discover complex patterns by testing hypotheses based on the data.

Factor analysis consists of five main steps: reliable measurements, correlation matrix, factor analysis, factor scores, and interpretation of the results. The flow diagram is reproduced in Figure 4.3.1 below. These steps will be discussed one at a time in the Result and Discussion chapter (Chapter 5).



Figure 4.3.1: The main steps of Exploratory Factor Analysis

4.3.1.1 Scale Reliability and Validity

Increasing the accuracy of the results as well as the evaluations, reliability and validity tests are two fundamental steps in data analysis. Reliability deals with the ability of survey questionnaires to measure consistently (Weiner, 2007). Validity deals with the extent to which a survey questionnaire measures what it is intended to measure (Weiner, 2007).

In this study, the first step is focused on the measurement of dimensions for the confirmation of all the items scales from market orientation and learning orientation, its reliability and validity, analysing the elements and parameters which determine the market orientation construct and organizational learning construct in the cow-calf industry. Scale

reliability is to improve existing scales and to evaluate the reliability of scales already in use. Scale reliability examines the level of correlations between the individual items and scales relative to the variances of the items (Weiner, 2007) . In other words, scale reliability measures the degree to which it is error-free (Micheels & Gow, 2014). The most common reliability analysis is Cronbach's coefficient *alpha* (Cronbach, 1951). Typically, the interval of Cronbach's *alpha* reliability coefficient is between 0 and 1. Based on George & Mallery's (2003) study, the reliability statistics or Cronbach's coefficient *alpha* less than 0.6 are normally considered to be questionable and poor, *alpha* between 0.7 and 0.8 are acceptable, while Cronbach's coefficient *alpha* greater than 0.8 are good and excellent. According to previous researchers, a Cronbach's coefficient *alpha* of 0.7 is a reasonable and the recommended cut-off level and more widely cited (George & Mallery, 2003; Melewar & Saunders, 1999; Nunnally, 1978).

Scale validity refers to the degree in which the measurement items and scales are truly measuring the underlying latent variables (Weiner, 2007). Convergent validity is examined in this thesis. Convergent validity is a way to provide evidence to show that all measurement items were loaded on the appropriate constructs. Because the underlying construct, which are market orientation and organizational learning, is unobservable, there are several methods to assess convergent validity. Confirmatory Factor Analysis is used to examine convergent validity because the Confirmatory Factor Analysis determines the factor and factor loading of measured variables, and to confirm what is expected on the basic theory. More specifically, it can measure factor weights between individual items and the latent factor. Furthermore, a correlation matrix is used to calculate and assess the correlations between individual measurement items and the rest of the measurement items in all the scales. With respect to the correlation matrix, two things

need to be noticed. First, the factors should be inter-correlated, but those factors should not correlate too highly, which would cause difficulties in determining the unique contribution of the variables to a factor (Weiner, 2007).

4.3.1.2 Factor Scores

In order to interpret the results from factor analysis and use those outputs as variables in the Ordinary Least Squares regressions, a factor score has to be considered as a variable describing how much an individual would score on a factor. The most common method to produce a factor score is called the Bartlett method; it is a regression method, which produces unbiased scores that are correlated only with their own factor (Tabachnick & Fidell, 2007). Factor scores can be treated as variables for further statistical analyses of variables and could overcome the issue of multicollinearity (Tabachnick & Fidell, 2007).

4.3.2 Binary Logit Model

In order to examine which management practice tools to adopt as well as test all the hypotheses presented in Chapter 3, the first model would utilize either a logit or probit model. A number of studies have investigated the influence of various social-economic and strategic factors on the willingness of farmers to adopt or use management tools (Johnson et al., 2010; Pruitt et al., 2012; Ward et al., 2008; Watcharaanantapong, 2012). In much of the adoption literature, the dependent variable is binary, so both the logit and probit models have been used extensively to study the adoption behavior of farmers. Farmers' decision whether to adopt record keeping and/or benchmarking is a key research question in the first part of this study. Johnson et al. (2010) have recommended the Binary Probit model for functional forms with limited dependent variables that

are continuous between 0 and 1 and the Binary logit model for discrete dependent variables. As the collected data for this model was not continuous, a Binary Logit model is developed to analyze the adoption behavior of cow-calf producers. The Binary Logit model, which can be a linear regression, has the advantage to predict the probability of farmers adopting any technology (Johnson et al., 2010; Pruitt et al., 2012). Thus, the Binary Logit model is found to be most appropriate in this study.

The Binary Logit model is a statistical probability model, and this analysis is based on the standard logistic distribution (Greene, 2012). The binary dependent variable, Y , takes on the values of one and zero. The outcomes of Y are mutually exclusive and exhaustive. The dependent variable, Y , depends on m observable variables X_m where $m=1, 2, 3 \dots N$ (Greene, 2012). When the value of one and zero were observed for the dependent variables in the Binary logit model, there was a latent, unobserved discrete variable, Y_n^* .

$$Y_n^* = \beta_0 + \beta_m' X_m \quad (4.1)$$

$$Y_n \sim \text{Bin}(n_i, \pi_i)$$

The dummy variable, Y_n , was observed and was determined by Y_n^* as follows.

$$Y_n = 1 \text{ if } Y_n^* > 0$$

$$Y_n = 0 \text{ if } Y_n^* \leq 0$$

Where Y_n^* is an unobservable dependent variable, coded as 1 for yes (adopt management tools) and 0 otherwise as appearing above; β_m is the vector of estimated parameters, while a random sample of size N with a sample observation denoted by \mathbf{m} , $\mathbf{m} = 1, 2, 3, \dots, n$; X_m is the vector of explanatory variables with a sample observation denoted by \mathbf{m} , $\mathbf{m} = 1, 2, 3, \dots, n$; Y_N^* is assumed to be binomial distributed with $\text{Bin}(n_i, \pi_i)$.

The Binary Logit model assumes that the data were generated from a random sample, and the observations of Y_n must be statistically independent of each other to rule out serial correlation. In addition, it was assumed that the independent variables were random variable.

The Maximum Likelihood estimation technique was used to estimate Binary logit model parameters. Maximum Likelihood estimation focuses on choosing parameter estimates that gave the highest likelihood of obtaining the observed sample Y_n . The purpose of maximum likelihood estimation was to choose as an estimate of the set of m numbers that would maximize the likelihood of having observed this particular Y_n (Greene, 2012).

A Binary Logit model is suitable to estimate the determinants of a cow-calf producer to adopt a recommended practice tool such as record keeping and benchmarking. As can be seen in the cow-calf management and marketing survey (Appendix 1), both section D and E were asked several questions about whether the producers adopted record keeping analysis and benchmarking based on their operation. One question asked was “Do you compare your production records with industry benchmarks? If so, which benchmarking do you use?” followed by four suggestions.

To discover whether producers adopted the recommended management tools, the binary logit model was used with three categories of producers 1) producers who adopted record keeping, 2) producers who did not adopt record keeping, and 3) producers who preferred not to answer whether they adopted record keeping or not. In order to facilitate the binary method, adoption of record keeping was transformed to 1 with all other options becoming 0.

Based on Greene (2012), equation (4.2) below displays the probabilities of two available choices being selected, and the assumption is error terms are independent and logistically distributed:

$$\text{Logit} (\pi_i) = x'_m \beta$$

Or

$$\begin{aligned}\pi_i (Y_i=1 | X) &= P(Y_i^*>0 | X) \\ &= \text{Exp} (x'_m \beta) / 1+\exp (x'_m \beta) \\ &=\Lambda (x'_m \beta)\end{aligned}\tag{4.2}$$

Then, the log Likelihood function is:

$$\text{Log } L = \sum [Y_i \log (\pi_i) + (N_i - Y_i) \log (1 - \pi_i)]$$

Where Y_i refers to individual producers; Λ is defined as cumulative distribution; π_i is the probability that an individual producer adopts the recommended practice tools. Specifically, the researcher observes $Y^*>0$, which means a cow-calf producer adopted either record keeping or benchmarking or both, and if $Y^*\leq 0$ otherwise.

The coefficients measures a one unit change in the independent variables based on the logarithm of the ratio of probability, of the cow-calf producer choosing to use the management tools, and measures the likelihood of adoptions (Greene, 2012). The marginal change in probability of the m th producer's adoption of a management tool results from a change in the i th independent variables, which is calculated as

$$\Delta_{mi} = \pi_{mi} (X_m=1) - \pi_{mi} (X_m=0)$$

With two management practice tools being investigated, there are four possible combinations for a cow-calf producer: a) use no record keeping and benchmarking considered in this study; b) use record keeping method only; c) use benchmarking method only and; d) use both record keeping and benchmarking. Given this choice set, three individual Binary Logit are specified and the three respective dependent variables are as follows:

- Producers Adopt Record Keeping (RK_n) = $\beta_0 + \beta_1 \text{ age}_j + \beta_2 \text{ education level}_j + \beta_3 \text{ herd size}_j + \beta_4 \text{ experience}_j + \beta_5 \text{ goal setting}_j + \beta_6 \text{ the influencers in decision making process}_j + \beta_7 \text{ family income derived from the operation}_j + \beta_8 \text{ location}_j + \beta_9 \text{ off-farm work}_j + \beta_{10} \text{ market orientation}_j + \beta_{11} \text{ learning orientation}_j + \varepsilon_j$ (4.3)
- Producers Adopt Benchmarking (BM_n) = $\beta_0 + \beta_1 \text{ age}_j + \beta_2 \text{ education level}_j + \beta_3 \text{ herd size}_j + \beta_4 \text{ experience}_j + \beta_5 \text{ goal setting}_j + \beta_6 \text{ the influencers in decision making process}_j + \beta_7 \text{ family income derived from the operation}_j + \beta_8 \text{ location}_j + \beta_9 \text{ off-farm work}_j + \beta_{10} \text{ market orientation}_j + \beta_{11} \text{ learning orientation}_j + \varepsilon_j$ (4.4)
- Producers adopt both Record Keeping and Benchmarking (RB_n) = $\beta_0 + \beta_1 \text{ age}_j + \beta_2 \text{ education level}_j + \beta_3 \text{ herd size}_j + \beta_4 \text{ experience}_j + \beta_5 \text{ goal setting}_j + \beta_6 \text{ the influencers in decision making process}_j + \beta_7 \text{ family income derived from the operation}_j + \beta_8 \text{ location}_j + \beta_9 \text{ off-farm work}_j + \beta_{10} \text{ market orientation}_j + \beta_{11} \text{ learning orientation}_j + \varepsilon_j$ (4.5)

Where: Each of the dependent variables RK_n , BM_n , and RB_n is a vector of binary variables, such that $RK_n=1$ if the N th producer chose to keep records on his/her operation, and 0 otherwise; B_{nm} are vectors of m explanatory variables of the N th farmer. It is assumed that B_{nm} is independent of the zero mean random variable. The β notations are parameters to be estimated, and ε is a normally distributed error term. The same explanatory variables included in each equation to account for the personal characteristics of each cow-calf producer were: *family income derived from the operation, age, experience, education level, herd size, locations, goal setting, the influencers in decision making process and off-farm work. Family income derived from the operation* indicated the percentage of family income generated from the cow-calf operation. *Age* is the age of the cow-calf producer in years, *education level* indicates the level of

formal education obtained by the primary decision producer, and *herd size* denotes the number of head in the operation of year 2014. *Experience* indicated the number of years that cow-calf producers have been operating their business. *The influencers in the decision making process* indicated individuals, besides the owner, who could have influenced producer use benchmarking and record keeping. *Locations* represents the province where the operation is located; options being Alberta, Saskatchewan, or Manitoba. *Off-farm work* captures whether or not the producer holds an off-farm job. Finally, the constructs of *market orientation* and *organizational learning* to assess the adoption of management tools were included as explanatory variables in the Binary Logit model.

4.3.3 Ordinary Least Squares Regressions

A general regression is developed to test the relationship between beef efficiency and productivity with latent variables, control variables as well as recommended management tools (record-keeping and benchmarking), so the Ordinary Least Squares (OLS) regression was used in this study. The basic setup for performance is beef production efficiency (Y_j), which is measured by *total pounds of calf weaned* divided by *total number of females exposed*. Beef production efficiency (Y_j), is a linear function of a vector of control variables (X_j), latent variables (Z_j) and two dummy variables (D_j). The linear regression equation can be written as:

$$Y_j = X_j' \beta + \lambda Z_j + \delta D_j + e_j \quad (4.6)$$

Where: e_j is a normal random disturbance, and the vector X_j represents farm characteristics, control variables, which include cow-calf producer's age, education level, number of cattle on the farm, experience, goals setting. The vector Z_j represents latent variables, which are market orientation and organizational learning. The vector D_j represents two different

dummy variables; record keeping and benchmarking.

Specifically, Ordinary Least Squares (OLS) regression includes latent variables, continuous variables and dummy variables as independent factors. Summated scores of market orientation and organizational learning were included in the OLS regression. Continuous variables such as number of cattle on the farm and cow-calf producer's age and purchased feed costs per head for one cycle were also included. Benchmarking, record keeping, location, and education level are measured by dummy variables.

Using SPSS Statistics to develop factor scores first, the retained factor score were used as variables in OLS regressions, which directed to test the hypotheses presented in chapter three. The OLS model to estimate beef production efficiency is as follows:

$$Y_j \text{ beef production efficiency (total pounds of calf weaned / total number of females exposed)} = \alpha + \beta_1 \text{ age}_j + \beta_2 \text{ education level}_j + \beta_3 \text{ herd size}_j + \beta_4 \text{ experience}_j + \beta_5 \text{ winter feeding cost}_j + \beta_6 \text{ goal setting}_j + \beta_7 \text{ benchmarking}_j + \beta_8 \text{ record keeping}_j + \beta_9 \text{ location}_j + \beta_{10} \text{ the influencers in decision making process} + \beta_{11} \text{ market orientation}_j + \beta_{12} \text{ learning orientation}_j + \beta_{13} \text{ average weaning weight} + \beta_{14} \text{ family income derived from the operation}_j + \beta_{15} \text{ off-farm work}_j + \varepsilon_j \quad (4.7)$$

Where: j: individual

ε_j : is assumed to be a random error term

Table 4.3 contains the definitions of the control variables and demographic characteristics.

Table 4.3 Cow-calf producers Characteristics, Descriptions and Expected Signs

Variables	Variables Description	Expected Sign
Age	Actual age in years for the cow-calf producers	+
Herd size	Actual number of head in operation	+
Education Level (Highest level of education attained by producer)	High school (1=YES, 0=NO) Trade or Technical school/College degree high school (1=YES, 0=NO) University degree and graduate degree (1=YES, 0=NO)	+
Winter Feeding Cost	The purchased feed cost (such as, hay, salt/mineral, grain, and bedding straw) per head for one production year. (Actual winter feeding days multiply by average feed cost per day \$2.50/d)	+
Experience	Actual number of years in operation	+
The Influencers in Decision Making Process	Banker/accountant (1=YES, 0=NO)	+
	Paid consultants (1=YES, 0=NO)	+
	Veterinarian (1=YES, 0=NO)	+
	Ag Extension personnel (1=YES, 0=NO)	+
	Spouse/other members of the family (1=YES, 0=NO)	+
Experience	Actual number of years for the cow-calf producers	+
Family Income Derived From the Operation (percentage)	0% to 24.99% (1=YES, 0=NO)	+
	25% to 49.99% (1=YES, 0=NO)	
	50% to 74.99% (1=YES, 0=NO)	
	More than 75% (1=YES, 0=NO)	
Off-farm Work	Extent of producer off-farm work (1=YES, 0=NO)	?
Location	Province operation is located.	?
	Alberta (AB) (1=YES, 0=NO)	
	Saskatchewan (SK) (1=YES, 0=NO)	
	Manitoba (MB) (1=YES, 0=NO)	
Benchmarking	Cow-calf producers adopt benchmarking (1=YES, 0=NO)	+
Record keeping	Cow-calf producers adopt record keeping (1=YES, 0=NO)	+
Average Weaning Weight	Actual average weaning weight for each cow-calf business (pounds)	+
Market Orientation	Factor score were computed in Factor analyses, which could use as variables to facilitate in the Binary logit analysis as well as Ordinary Least Squares analysis.	+
Organizational Learning	The measurement was the exact same done by Market orientation.	+

4.3.3.1 Expected Sign for Each Variable in Production Model

The test variables will be discussed in the context of the production model, and the expected sign shown in Table 4.3. *Cow-herd size* was expected to be significant and have a positive relationship with production or performance, which has been found in previous research (Johnson et al., 2010; Micheels & Gow, 2008; Pruitt et al., 2012). Previous research found feed costs to be the largest expense in the cow-calf operation (Falconer, Parker, & McGrann, 1999; Ramsey et al., 2005). Hence, the coefficient for winter feeding costs in the production model was expected to be positive. In other words, when energy requirements for maintenance and pregnancy are met, it may increase feeding costs, resulting in the healthy calves and higher milk production, which could lead to increased total pounds weaned.

Previous literature highlights the importance of human capital to performance in the cow-calf operation (Johnson et al., 2010; Pruitt et al., 2012). Specifically, *producers' experience* and *education level* were expected to increase beef production and have positive coefficients in the production model. For example, Ward et al (2008) and Johnson et al (2010) found that higher education and greater experience resulted in better beef production. Anticipating the relationship of producer's age in the production model is difficult because age has showed mixed results (Ward et al., 2008).

The *influencers in the decision making process* could contribute to increased or decreased beef production depending on what is suggestion to the producer regarding the use of benchmarking and record keeping and how the influencers contribute to the cow-calf operation. Influencers will have expected advice for different parts of the operation. For example, veterinarians can provide advice on how to increase reproductive rates whereas consultants and bankers may be best at providing advices on incorporation or succession planning. In general,

seeking advice is expected to increase beef production and have a positive coefficient sign in the production model. However, if the *influencers in the decision making process* are not clearly connected to improving beef production or the firm's performance, the expected relationship might not give a positive result.

Benchmarking is focused on improving performance by continuously identifying, understanding, and adapting best practices to those found both inside and outside an organization (Kelessidis, 2000). Similarly, *record keeping* is a key step to have good and accurate information for management decision making in the future, which can indirectly lead to increased beef production. Therefore, producers who adopt record keeping and/or benchmarking were expected to increase beef production and have a positive coefficient.

The constructs of *market orientation* and *organizational learning* were expected to increase beef productivity with a positive coefficient sign. Previous research found market orientation and/or organizational learning had an impact on the overall performance measure of the cow-calf operation (Micheels & Gow, 2008; Micheels, 2010).

4.4 Summary

Chapter Four presented the empirical framework on which the thesis is based and introduced the different econometric models used to estimate data that came from the western Canadian cow-calf management and marketing survey. A Binary Logit model identifies the factors and constructs that influence a cow-calf producer to adopt management practice tools by using factor analysis. Moreover, a framework using an Ordinary Least Squares model was developed based on factor analysis and previous econometric studies. A list of explanatory variables was

identified from the theory and the literature. The econometric model will be estimated and the results from the regression analysis will be presented and discussed in Chapter Five.

Chapter 5: Analysis and Results

5.1 Introduction

The objective of this chapter is to model beef production efficiency. There are several steps in the calculation of beef production efficiency. First, the descriptive statistics of the survey are reported in Section 5.2. Second, measurements of the information relating to the factor analysis approach are used to assess the underlying factors in terms of validity and reliability in Section 5.3. Finally, Section 5.4 presents the results from the hypotheses testing by estimating the Binary Logit and Ordinary Least Squares models. The results are used in Chapter Six to draw managerial and policy implications.

5.2 Descriptive Statistics

Before examining the regression analysis, the data must be assessed by checking descriptive statistics for the variables (Groeneveld & Meeden, 1984). A brief summary for all respondents is given in Table 5.1 based on the survey responses for demographic characteristics and relevant characteristics. A total of 67 respondents completed the survey. Specifically, 45 respondents were commercial cow-calf producers, 6 were purebred cow-calf producers, and 19 indicated they had both operations. The average age of respondents was 47.3, which is less than the average age (54) of Canadian farm operators as reported by Statistics Canada (2013b). The respondents' ages ranged from 26 to 79. The average herd size was 317 head with the maximum herd size being 2700 and the minimum 77. The years of operation (experience) had a mean of 29.3, which is higher than the average experience (28) of Canadian farm operators as reported by the Western Canadian Cow-calf Survey (2015); and ranged from a couple years in the business to 50 years.

Table 5.1: Demographics Information of Cow-calf producers

		Min.	Max.	Mean / %	Comparative Cdn. Statistics	Std. Deviation
Age		26	79	47.3	54	11.09157
Herd size		77	2700	317.25	145	374.065
Experience		2	50	29.3	28*	
Location:	AB			50.90%	50.0% **	
	SK			30%	34.0% **	
	MB			19.10%	16.0% **	
Education:	High School			41.70%	49.30%	
	Trade/technical school & College degree			32.30%	28.10%	
	University Degree			23.20%	16.60%	
	Graduate Degree			5.80%	6.00%	
Off Farm Work				14%	46%	

*Based on Western Canadian Cow-calf Survey (2015), the average years of operation as a cattle farm was 28 years.

** According to Statistic Canada (Table 033-0099), Alberta has 50% of the Prairie Provinces reported cattle farms, while Saskatchewan has 34% and Manitoba 16%.

The survey showed that 31.7% of respondents derived 50% to 74.99% of their income from their cow-calf operation, 25% specifying in the range of 25% to 49.99%, 15% showing from 0% to 24.99%, and 26.7% indicating more than 75% total family income from their operation. As depicted in Table 5.1, the number of respondents from each province (AB, SK and MB) relative to the Prairie population is reasonably representative with 50.9% of the survey respondents located in Alberta, 30% in Saskatchewan and 19.1% in Manitoba. Moreover, it can be observed from Table 5.1 that survey sample representation of the education level complies with 2011 Census data, with 41.7% of the respondents having graduated from high school, 23.2% of the respondents holding a university degree, 32.3% of them having attended trade school or college degree, and 5.8% of them holding graduate degree. Furthermore, according to Statistics Canada (2014), 46% of Canadian farmers have paid off-farm work; however, in this sample, only 14% of producers hold off-farm employment.

5.2.1 Influential Variables

In addition to ascertaining the use of management tools for respondents, several questions were included in the survey to facilitate the analysis of record keeping and benchmarking among cow-calf producers.

First, respondents were asked about their records and business plans with influencers in their decision-making process. In Figure 5.1, it is evident that the greatest influencers in overall performance decisions were other family members or a spouse with 91.7% of survey respondents selective that option. The second most popular influencer was discussion groups or other farmers, gathering 38.3% of responses. Bankers and accountants were the third main influencer with 36.7%. Of the respondents 26.7% indicated that they discuss their overall performance decisions with their veterinarian. Also, paid consultants and ag-extension personnel were consulted by 8.3% and 6.7% of respondents, respectively. These results show that, in addition to other family members and spouses, bankers/accountants and social networkers (other farmers and discussion groups) also play an important role when respondents look for advice while making decisions. Paid consultants are supposed to provide an objective, unbiased view of the farmer's business with recommendations that might improve the performance of the business. However, most cow-calf producers indicated that they do not use a consultant to help with decision making in this sample, even though there is government funding (e.g. Farm Business Development Initiative⁹) available to help cover the cost of paid consultants.

⁹ The Farm Business Development Initiative (FBDI) program is funded through *Growing Forward 2* in Saskatchewan, which covered a proportion of various costs in the areas of business practices. For additional information visit: <http://www.agriculture.gov.sk.ca/GF2-FBDI>

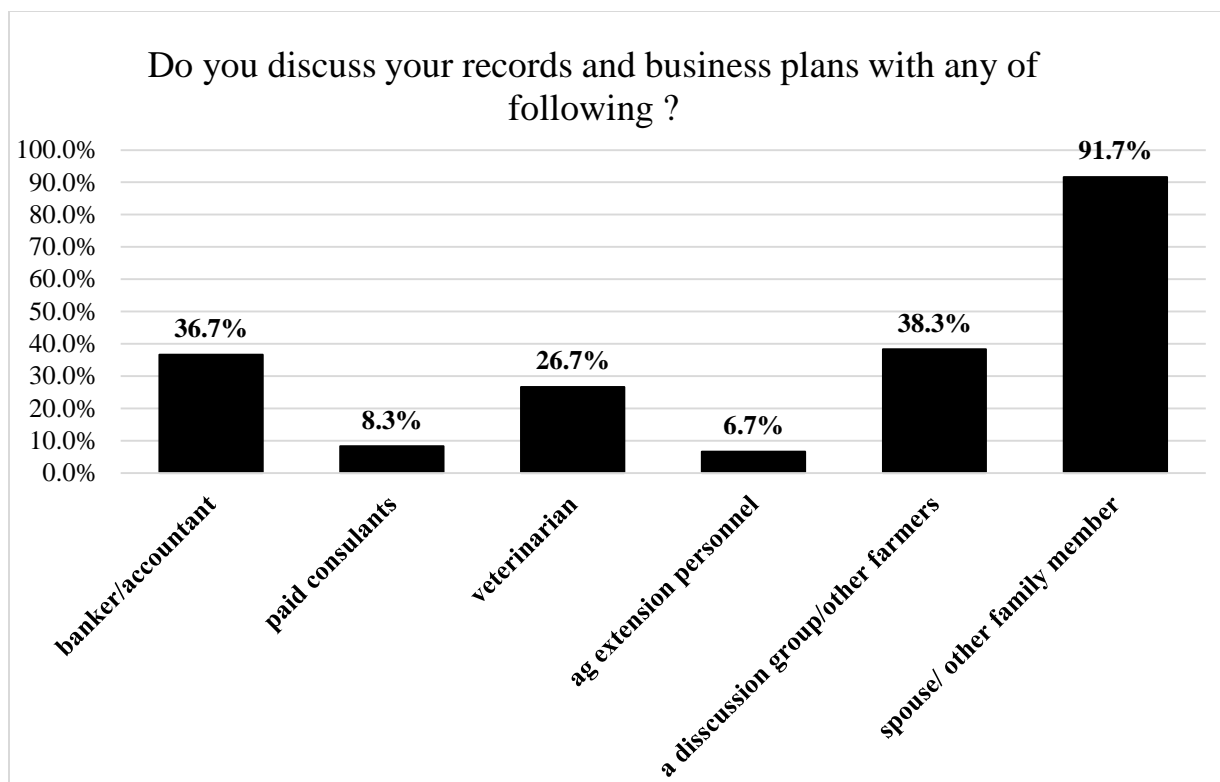


Figure 5.1: Influencing Functionary in Decision Making Process

Second, cow-calf producers were asked about setting goals for their farm business. The majority of respondents set both production (91.7%) and financial goals (68.3%) as seen in Figure 5.2. From a management perspective, having goals is like following a road map, they help producers plan how to get to where they want to go. Keeping and analyzing records is important to accomplish a goal. Hellriegel, Slocum, & Woodman (1992) found that one of most important purposes of goal setting is to improve performance as well as financial success. Thus, keeping records could be a useful tool to measure and track goal setting and business success.

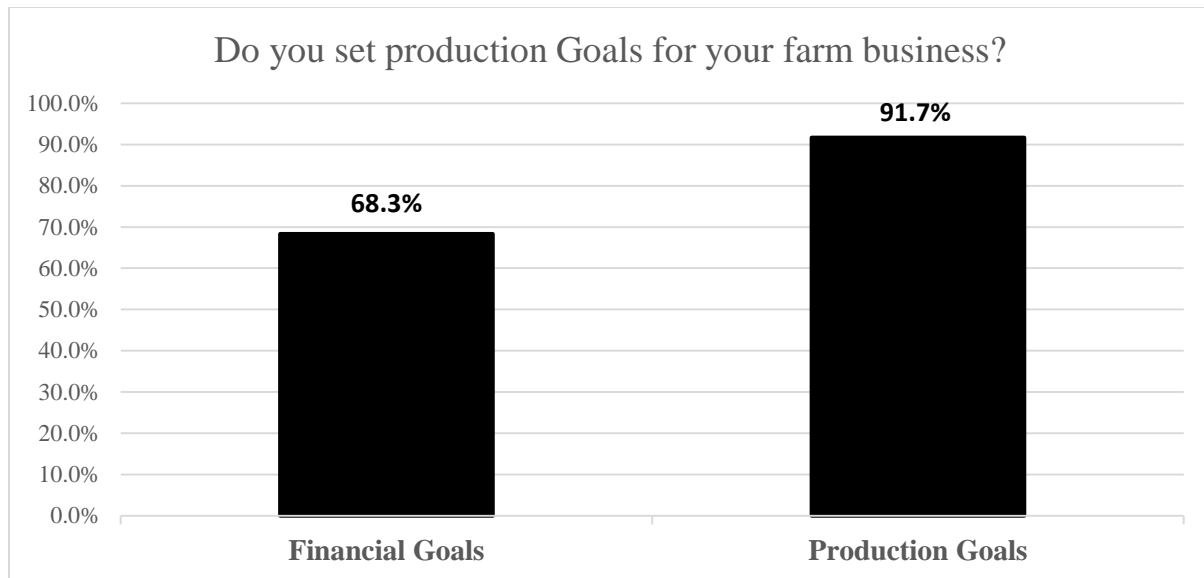


Figure 5.2: Percentage Goal Setting for Cow-calf Producers

5.2.2 Detailed Production Record Keeping and Benchmarking

An objective of this research is to ascertain what kind of production records cow-calf producers maintain. Respondents were asked to indicate which typical production records they kept; *Birth weight, Birth date, Individual ID, Weaning weight, 205 day adjusted weight, Culling/death loss records, Health records* as can be seen in Figure 5.3. The most important records are *birth date, weaning weight* and *calf's ID linked to dam ID* based on discussion with beef experts.

Approximately 98.6 % of respondents recorded *Birth date*, and 91.3% of them keep *calf's ID linked to dam ID* record. However, only 42% of respondents track *weaning weights*. If producers track birth date, weaning weight and calf's ID linked to dam ID, they can calculate calving distribution, calving span, calving interval, pounds weaned per cow wintered. The ability to know which calf belongs to which dam and associated measurements on the calf (birth date, birth weight, and weaning weight) allows for analysis on an individual productivity level (per cow) rather than overall herd productivity. Knowing productive performance of individual females allows for improved selection of replacements, which can lead to improved herd performance.

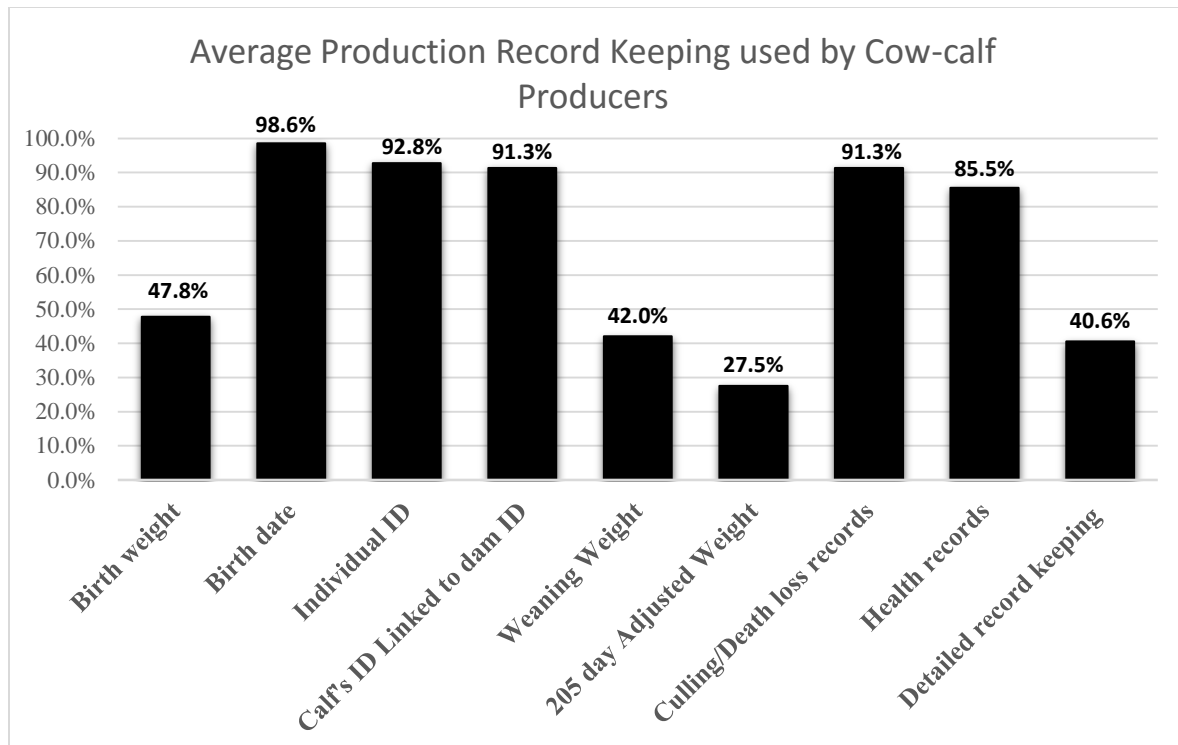


Figure 5.3: Average production record keeping used by respondents

In addition, cow-calf producers were also asked about their familiarity with benchmarking, with only 36.7% of the respondents indicated that they were familiar and used benchmarking, as can be seen in Figure 5.4. Because of the low response rate in this sample, it could mean a lot of cow-calf producers are not familiar with benchmarking or even do not know what benchmarking is. If this is the case, promoting the use of benchmarking is important. As discussed in the previous chapter, benchmarking could provide a valuable opportunity to cow-calf producers to compare their results with the provincial, national even international level, and thus make accurate improvements.

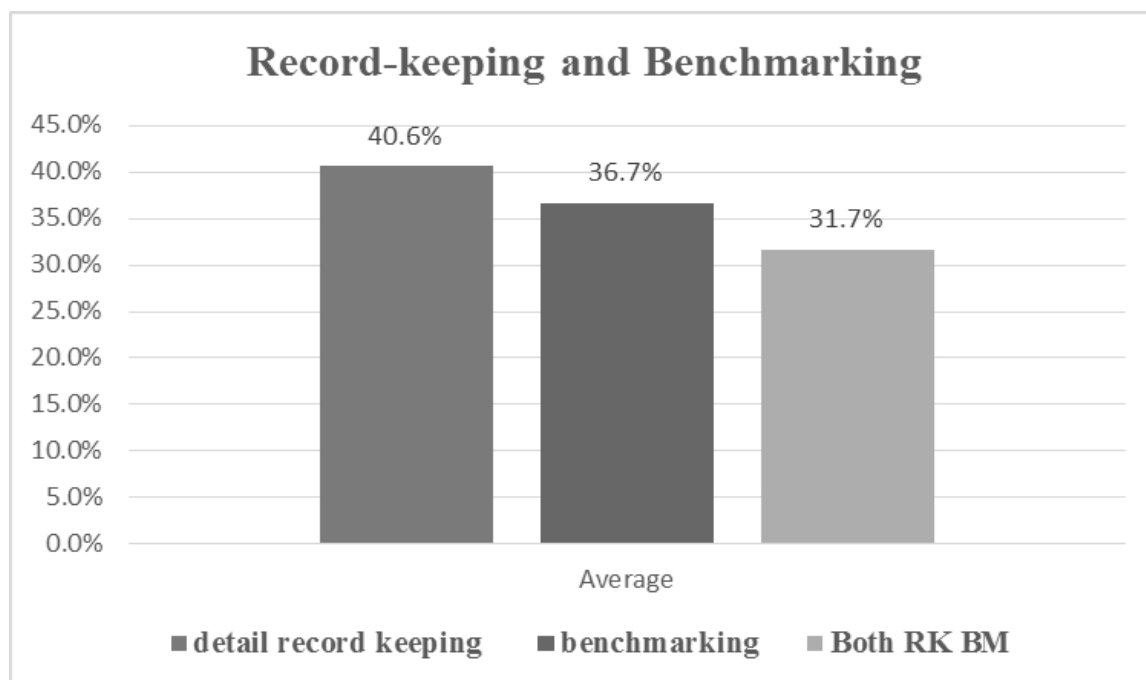


Figure 5.4: Production Record Keeping and Benchmarking

5.3 Measurement Scales

5.3.1 Market Orientation

Narver & Slater (1990) developed the first scales to measure the construct of market orientation for an individual firm. In this thesis, a cow-calf producer's market orientation consists of a competitor and buyer (customer) focus within the firm. As discussed in Chapter 4, the coordination of market knowledge between departments was not included in analysis, because most cow-calf producers in the Prairie Provinces manage all of their business transactions, from purchasing breeding cattle to selling their calves to order buyers, auction market, feedlot owners (backgrounders and finishers), or through other ways, so this component of inter-functional coordination is not a necessary factor. A principal component (factor) analysis is conducted for each of the two dimensions of market orientation in order to identify the number of components that establishes each dimension.

A competitor orientation is one of the dimensions of market orientation, and eight statements measure this dimension. A competitor orientation consists of two factors. When the dimension consists of multiple factors, these are generally weighted equally in the construction of the index; however, the first component of factor loading for item 1, 2, and 4 is less than the second component. It means if these items were included in both components, the effect of item 1, 2, and 4 would be outweighed. Therefore, the factor loadings item 1, 2, and 4 are only included in the second component, and the rest of the items are from the first component as reported in Table 5.2. Additionally, the customer orientation dimension of market orientation is measured using six items. The factor analysis is only derived from one component.

Consequently, reliability analysis (Table 5.2) showed that the total Cronbach's alpha value of the Market Orientation was 0.827, which indicates a high level of internal consistency based on Nunnally (1978). Also, the total value Guttman's λ_2 for market orientation was 0.835, which displayed good construct reliability. The Cronbach's alpha values of the competitor orientation and consumer orientation were 0.826 and 0.925 respectively. Those items showed high levels of internal consistency.

The Average Variance Extracted (AVE) value of the market orientation was 61.35 percent, more than the 50 percent cut off based on Fornell & Larcker's (1981) suggestions. It indicated that all the results of the AVE are satisfied by construct validity. Moreover, the 14 items examined were factor loadings and are all greater than 0.599, which is greater than 0.32 the cut off suggested by Worthington & Whittaker (2006). It means these items are likely measuring or explaining what they are intended to measure and indicated a high level of construct validity.

Furthermore, all the items had a Corrected Item to Total Correlation greater than 0.494, which is greater than the 0.20 cut off recommended by Streiner & Norman (1995). It indicates

that the corresponding items correlate very well with the scale overall. Therefore, findings suggested that all 14 items had a high level of internal consistency and had valid constructs for measuring market orientation (competitor orientation and consumer orientation).

Table 5.2 Reliability and Validity for the Market Orientation Scale:

Market Orientation (Cronbach's Alpha =0.827, λ_2 =0.835, AVE =61.359%)	Factor loadings	Corrected Item Total Correlation
1. We discuss information concerning competitors' (neighbours and other cattle producers) strategies.	0.634*	0.494
2. We are quick to respond to competitive actions that threaten our operation.	0.639*	0.495
3. We target buyers where we have, or can develop, a distinct advantage.	0.603	0.592
4. We regularly discuss competitors' (in our case, it refers to neighbor and other cow-calf producers') strengths and strategies.	0.646*	0.543
5. We regularly visit current buyers to see how our cattle are meeting their needs.	0.697	0.580
6. We discuss reasons for successful and unsuccessful buyer experiences on a regular basis.	0.690	0.651
7. We coordinate all of our business functions (from buying to producing, selling and accounting) in order to better serve the needs of our target markets.	0.733	0.591
8. We understand how everything in our operation can contribute to creating market value.	0.599	0.470
9. The business objectives on our operation are driven by consumer (in our case, it refers to the feedlot owner buying a producer's cattle) satisfaction.	0.724	0.734
10. We continually monitor our level of commitment to serving market demands.	0.827	0.849
11. Our strategy to improve performance is based on our understanding of what the market wants.	0.794	0.798
12. Our strategies are driven by our beliefs about how we can create greater value for our buyers.	0.811	0.828
13. We measure buyer satisfaction regularly.	0.863	0.835
14. We pay close attention to our buyer, even after our cattle are sold.	0.770	0.691

Note: the items with * means the factor loadings from the second component

5.3.2 Organizational Learning

Farrell & Oczkowski (2002) and Slater & Narver (1995) found that organizational learning was an important determinant of firm performance. Sinkula et al. (1997) developed a scale that measures the organizational learning of the firm, which includes: commitment to learning, open-mindedness and shared vision. In this thesis two components are used, which are open-mindedness and commitment to learning. The shared vision influences the direction of learning, but this study primarily investigates the focus of learning, in which commitment to learning and open-mindedness are better suited to the cow-calf operation's production. In total, 12 statements were posed to measure learning orientation of cow-calf firms.

The commitment to the learning is a part of learning orientation that is measured by using six items, and this component derived as one factor. The open-mindedness component also included six items; the factor analysis derived two distinct factors. Item 8 and 11 were negative for component 2 in the open-mindedness dimension, which means that if those items were included in both components the effect of item 8 and 11 would be outweighed. Thus, item 8 and 11 are only included in the second factor, and factor 1 contains the rest of the items (See Table 5.3).

The Cronbach's alphas value of learning orientation was 0.720 showing a good reliability. Like Cronbach's α , the total value Guttman's λ_2 was 0.795, which exceeds the recommended level to satisfy the reliability requirements (Guttman, 1945). The average variance extracted (AVE) of organizational learning is 60.776%, which is higher than the recommended level of 0.5 (Fornell & Larcker, 1981). The AVE values indicate the variance due to the construct is greater than the variance due to the measurement error. Thus, the validity of the

constructs was highly satisfactory (see Table 5.3). Therefore, learning orientation (commitment to learning and open-mindedness) is satisfying the criteria of reliability.

Table 5.3 Reliability and Validity for the Learning Orientation Scale:

Learning Orientation (Cronbach's Alpha =0.720, λ_2 =0.795, AVE =60.776%)	Factor loadings	Corrected Item-Total Correlation
1. We basically agree that our farm/ranch's ability to learn is the key to our competitive advantage.	0.702	0.724
2. The basic values of this farm/ranch include learning as key to improvement.	0.617*	0.703
3. The sense around here is that learning is an investment, not an expense	0.815	0.765
4. Learning on my farm/ranch is seen as a key commodity, necessary to guarantee survival.	0.779	0.692
5. Our culture is one that does not make learning a top priority	0.609*	0.275
6. The collective wisdom on this farm/ranch is that once we quit learning, we endanger our future.	0.772	0.481
7. We are not afraid to reflect critically on the beliefs and assumptions we have about the way we ranch/farm.	0.824	0.464
8. Decision-makers on this farm/ranch do not want their "view of the world" to be questioned.	0.796	0.094
9. Our farm/ranch places a high value on open-mindedness.	0.809	0.593
10. All labourers on this farm/ranch – paid and unpaid - are encouraged to "think outside of the box."	0.778	0.522
11. An emphasis on constant innovation is not a part of our farm/ranch's culture.	0.425*	0.169
12. Original ideas are highly valued on this farm/ranch.	0.662	0.668

Note: the items with * means the factor loadings from the second component

5.4 Hypotheses Testing and Results

The hypotheses were tested using STATA 13.0. Multiple regression analyses were conducted to test the hypothesized models. Regression analysis tests whether the variance in a dependent variable, Y, is explained by the variance in the independent variables by assuming that Y is a linear function of X_n ($n=1,2,3...k$). A number of assumptions underlie this method of analysis.

To test for the possibility of multicollinearity, both the independent and control variables were tested through Variance Inflation Factors (VIF) before running the regressions. A VIF is one of several possible methods to exam multicollinearity among the variables in a regression model (Greene, 2012). Values of VIF exceeding 10 are the signs of multicollinearity while values less than 2.5 indicate stability of the coefficients (Greene, 2012). The results from the VIF analysis in Table 5.5 show that the regression coefficients are not correlated as VIF values are all below the rule of thumb of 2.5.

Also, adding the quadratic version of a continuous variable to ensure that the assumption of a linear regression is satisfied in the models (Greene, 2012). Since the *farm size* has the range from 2700 to 77, the variable of farm size is the candidate for the linear and non-linear treatment. Then, one more variable is created *farm size squared* and estimates the model with both versions of farm size. The coefficient of *farm size* and *farm size squared* are both not significant and indicated that the relationship between those variables is not non-linear (see Table 5.5).

In order to test the hypotheses presented in Chapter 3, two models were developed, the Binary Logit model (BLM) and the Ordinary Least Squares model (OLSM). The results from the multiple regression analyses of the two models are presented separately in Sections 5.4.1 and 5.4.2.

5.4.1 Binary Logit model

A Binary Logit model (BLM) was employed to examine the determinants that affect cow-calf producers adoption of management tools, specifically record keeping and benchmarking. Therefore, a total of three equations are included in this section.

A total of 11 explanatory variables were included in the Binary Logit model, with two of these variables expected to affect the adoption of record keeping, benchmarking or both tools included: market orientation and organizational learning. The remaining variables are control variables, such as goal setting, influencers in the decision making process, and the percentage of farm income from cow-calf operations. Control variables were included to avoid model misspecification, including age, years of experience, location (Saskatchewan and Manitoba with Alberta omitted as a reference variable), extent of producer off-farm work, and herd size. In an effort to avoid multi-correlation, the university degree and graduate degree variable were combined given only 3 respondents in the sample hold graduate degrees. The variable was renamed *University degree or higher*. Therefore, the level of education included three dummy variables (High school, Trade technical School and College degree, with University degree or higher omitted as a reference variable). The results of the binary logit model estimations for different management tools are presented in the following sections.

5.4.1.1 Dependents variables in Binary Logit model

As discussed in the previous section, the respondents were asked: *what do your cow-calf production records include?* With respondents asked to check all that apply from a list which included *Birth weight, Birth date, Individual ID, Weaning weight, 205 day adjusted weight, Culling/death loss records, and Health records*. If respondents chose *Calf ID linked to Dam ID, Birth date, and Weaning weight*, it was determined these cow-calf producers kept detailed production records. In order to estimate the binary logit model, the dependent variable was transformed into a dummy variable. If a respondent chose these 3 options, then record keeping was transformed to 1. Zero means the respondent did not keep detailed production records in Equation 1.

Similarly, respondents were asked: *Do you compare your production records with industry benchmarking?* The responses were separated into two categories: yes and no. The dependent variable for Equation 2 was also transformed into a dummy variable, where the use of benchmarking responses was represented by 1, and non-benchmarking responses were given 0.

Model 3 combines Model 1 (record keeping) and Model 2 variables (benchmarking). If the respondents maintain detailed production records and use benchmarking, then the dependent variable for Equation 3, use both management tools is coded as 1 and 0 otherwise. The goal is to test if there are significant impacts associated with both constructs of market orientation and organizational learning on use of both management tools for producers.

5.4.1.2 Record keeping

The record keeping equation results suggest that 11 out of 22 estimated variables are influential predictors of a cow-calf producer to keep detailed records. Test statistics suggest a reasonable relationship between record keeping and the independent variables. Estimated marginal effects (change in probability) from the logit analysis for record keeping were presented on the left column in Table 5.4, where the p-value indicates half the variables are significant at 1%, 5%, and 10%, respectively. This regression model achieves a good McFadden R^2 that equals to 0.3119. According to Hensher & Johnson (1981), the value of McFadden R^2 from 0.2 to 0.4 indicated excellent model fit. Marginal Effects is a method to measure the impact of a change in an independent variable on the expected change in the dependent variable. In other words, marginal effects is an estimation of the change in probability when the independent variable increases by one unit for both dummy and continuous variables.

Table 5.4 Results of Binary Logit Analysis Marginal Effects

Independent Variables			Dependent Variable(s)		
			Record Keeping	Benchmarking	Record Keeping & Benchmarking
			Change in Probability		
Market Orientation			10.98%	11.88%	15.66%
Organizational Learning			5.08% **	32.37% **	13.24% **
Age			0.47% **	0.69%	0.60%
Herd size			-0.04% **	0.07%	0.01%
Experience			1.07% **	-0.15%	0.35%
Location:		MB	-3.05% **	32.97%**	40.91% **
		SK	-5.72%**	-47.84%**	-33.39%**
Education:	High school		-3.85% ***	-19.3%	-23.34%
	Trade technical School/College degree		-4.45% *	-10.88%	-9.64%
	University degree		-1.36%	-10.03%	-2.96%
Percentage of total 2015 family income From Cow-calf Operations:		0%-24.99%	-31.08%	6.01%	-3.71%
		25%-49.99%	-77.98% **	-12.90%	-29.03% **
		50%-74.99%	-19.66%	-19.38%	-16.61%
Banker/Accountant			-16.81%	39.55%*	24.07%
Paid Consultants			29.24%	-18.13%	-15.47%
Veterinarian			7.84%	-28.10%	-24.02%
Ag-extension Personnel			-26.39%	-5.02%	-1.90%
A discussion group other farmer			24.04%	8.97%	16.95%
Spouse/other members of the family			32.21%	6.60%	3.54%
Financial Goals			-22.73%	-20.68%	-10.15%
Production Goals			5.09% **	-16.87%	4.72%
Off-Farm Work			-5.64% *	5.19%	17.50%
McFadden R-squares			0.3119	0.3745	0.33807
<i>Note: Significance is indicated at the following levels: *$p > 0.1$; ** $p > 0.05$; *** $p > 0.01$</i>					

The marginal effects of the Binary logit model are estimated and presented in Table 5.4.

Learning oriented cow-calf producers were 5.08% more likely to use and keep detailed

production records. However, market orientation, a key construct identified by previous research (Micheels & Gow, 2008), is found to have no significant effect on producer record keeping. This is an interesting and unexpected finding of this thesis. Additionally, years of experience, age and production goals setting positively affected the use of record keeping tools for cow-calf producers. Producers who set production goals were 5.09% more likely to use record keeping. These are expected results. Interestingly, herd size is a negative and significant association with using record keeping. It is a reasonable finding because producers need to spend more time to track/keep detailed production records, with increasing herd size, time becomes limited and ability to commit to detailed record and analysis diminishes.

Moreover, having a lower level of education was expected to decrease the probability that a producer uses a record keeping tools and analysis those records. Producers holding high school education or trade technical school/college degree were 3.85% and 4.45% *less likely* to analysis their records. Based on this sample size, Saskatchewan and Manitoba producers were, respectively, 3.05% and 5.72 % less likely to use the detailed record keeping than producers from Alberta.

A greater reliance on the cow-calf operations for family income was expected to have a positive relationship with detailed production record keeping. Producers with total family income from beef production ranging from 25% to 49.99% were 77.98% less likely to keep detailed records. The reason could be that producers from mixed farmers care more about their crop business rather than the livestock business.

5.4.1.3 Benchmarking

The benchmarking equation results suggest that only 4 out of 22 estimated variables are influential predictors of a cow-calf producer using benchmarks to compare performance. Test statistics suggest an acceptable relationship between the benchmarking and all the independent variables. As shown in the centre column of Table 5.4, the p-values indicate four variables are significant at 1% and 5%, respectively. This regression model also achieves an excellent degree of McFadden R-squared equal to 0.3745.

Only few significant factors were identified regarding producers' probability of using benchmarking for their operation. Learning orientation and the use of a banker/accountant positively impacted this probability. Learning orientation demonstrates a positive and significant association with producer use of record keeping as well. Importantly, learning oriented producers were 32.37% more likely to use benchmarking. Similar to record keeping, market orientation does not significantly influence the use of benchmarking. The use of bankers and accountants for decision making was 39.55% more likely to suggest producer will compare themselves with available industry benchmarks. Usually, bankers and accountants help the producers to make financial decisions, so this is an expected result.

Moreover, Manitoba producers were, respectively, 32.97% more likely to use benchmarking; interestingly, Saskatchewan producers were 47.84% less likely to use benchmarking comparing with producers from Alberta.

5.4.1.4 Record keeping and Benchmarking

The third equation results also only recommend that 4 out of 22 estimated variables are influential predictors of a cow-calf producer to use both management tools. Test statistics show a

satisfactory relationship between both tools and all the independent variables. As shown in the right most column of Table 5.4, the p-values indicate four variables are significant at the 5%. This regression model also shows a strong degree of fit, as reflected by McFadden R-squared of 0.338.

Again, learning oriented cow-calf producers were 13.24% more likely to use both management tools. Like Equation 1 and 2, market orientation still is found to have no significant effect on producer use of record keeping and benchmarking. This may be because producers for the most part still do not pay attention to downstream player needs.

Similar to the benchmarking equation, Manitoba producers were 40.91% more likely to use both record keeping and benchmarking, Saskatchewan producers were 33.39% less likely to use record keeping and benchmarking compared to producers from Alberta.

Furthermore, producers that draw 25% to 49.99% of their total family income from beef production were 29.03% less likely to keep detailed records and use benchmarking, similar to Equation 1. Again, the reason might be given that producers are less dependent on their livestock operation for income they are focused more on the crop business.

5.4.2 Ordinary Least Squares model

As discussed in chapter 3, one of the goals of cow-calf producers should be to attain as many pounds of calf to market utilizing the least amount of resources; therefore, the cow-calf producers can achieve higher performance. Efficiency can be achieved through higher cow-herd reproductive (beef production), and lower feed (cost) use. Beef herds that are production efficient will have more pregnant cows (higher conception rate), which could lead to more calves born and more pounds available to be marketed.

In order to test beef production efficiency, this thesis conducted an Ordinary Least Squares model. Specifically, the dependent variable was beef production efficiency, which is measured by *total pounds of calves weaned* divided by *total number of females exposed*¹⁰. Two underlying constructs of market orientation and learning orientation as the structural factors were also used. Managerial factors (record keeping and benchmarking) as already tested in the previous section were applied to examine how they affect overall performance. Other factors, such as: average weaning weight per calf and winter feeding costs were also considered in this model. Finally, demographic variables are also included in this ordinary least squares model, including age, years of experience, level of education (High school, Trade technical School/College degree, and University/Graduate degree), location (Saskatchewan and Manitoba with Alberta omitted as a reference variable), extent of producer off-farm work, herd size and herd size squared.

General results are summarized first. The model observed in Table 5.5 includes 61 observations. The R-squared value for this estimation is 0.705, and the adjusted R-squared is 0.6033 concluding a reasonable goodness of fit. It means 60.33 percent of the variation in beef production is explained. The model also produced an F-statistic value of 34.49 making the overall model significant, which indicates that many independent variables are statistically significant for explanation of beef production in pounds.

When interpreting the significance of the parameters most of the estimates indicate significant p-values. Some of the estimates in Table 5.5 are found significant at the 0.1 level. In this Ordinary Least Squares model, the significant independent variables are *benchmarking*, *market orientation*, *learning orientation*, *weaning weight*, *feed cost*, *educational level*,

¹⁰ Data regarding “total number of females exposed” is derived from a survey in March, 2015, rather than the survey conducted specifically for this research. There are up to four surveys administered each year, to the producers in the 5-year BCRC-funded study led by Dr. John Campbell.

experience, and *some of the influential functionary in decision making process*. In general, Table 5.5 shows that both market orientation and learning orientation have significant positive ($p>0.1$) association with beef production efficiency. Also, the parameters for benchmarking exhibit a positive impact on overall performance. As can be seen from the Table 5.5, many interesting findings appear.

Market oriented and learning oriented dimensions of managerial factors are the most influential in determining the variation in production efficiency. In addition, producers compare their production records with industry benchmarks that demonstrate the positive and significant association with overall performance in these results. The positive sign of market orientation, learning orientation, record keeping and benchmarking shows the greater extent of those relationship variables, the higher the level of production efficiency. Therefore, on the basis of the analysis made, it can be said that market oriented producers most likely keep detailed production records and compare themselves with industry benchmarks which can improve production efficiency.

The Beta value for the *influencers in the decision making process* and beef production efficiency show primarily that producers have greater returns from discussing their beef production with or veterinarians, paid consultants, and other farmers /discussion groups. This result is not surprising, because veterinarians provide a service to maximize the health and productivity for each individual herd. Paid consultants are usually offering support and advice to farmers to ensure their business run as efficiently as possible from both the production and financial side. Results show that discussion of beef reproductive efficiency between producers and bankers or accountants may lower beef production efficiency. This may be the result of

bankers and accountants focusing on the reduction of costs rather than the improvement of production. Bankers and accountants would not have any expert advice on this topic.

Table 5.5 Results of Ordinary Least Squares Model

Independent Variables		Coefficient	Std. Error	P-value	Variance Inflation Factors
Constant		38.522	115.26	0.596	
Detail Record Keeping		2.027	36.623	0.956	2.272
Benchmarking		60.152*	32.099	0.055	2.123
Total size		-0.00719	0.122648	0.964	16.523
Total size ²		0.00000000141	0.00000000497	0.778	15.973
Feed costs		-0.088	0.087	0.472	1.530
Experience		-1.151*	1.177	0.027	1.599
SK		-16.296	37.191	0.735	2.274
MB		-20.422	38.408	0.669	1.767
High school		-72.637*	30.862	0.024	1.803
Trade/technical school/ college degree		-74.113*	43.487	0.097	1.769
Age		0.812	1.294	0.514	1.759
Percentage of total 2015 family income from cow-calf operation	0-24.99%	-20.403	46.297	0.67	1.838
	25%-49.99%	26.963	39.791	0.502	2.041
	50%-74.99%	-40.404	40.359	0.323	2.173
Banker/accountant		-19.959*	33.13	0.051	1.957
Paid consultants		8.65*	5.7033	0.028	1.913
Veterinarian		57.512*	36.997	0.092	2.023
Ag extension personnel		-20.822	65.366	0.752	1.904
A discussion group/other farmers		26.379*	21.347	0.037	1.564
Past production goals		21.455	49.402	0.667	1.432
Off Farm work		-39.545	50.531	0.437	1.652
Market Orientation		34.837*	34.162	0.082	2.084
Learning Orientation		12.134*	22.723	0.072	1.911
Average Weaning Weight		0.807***	0.121	0.000	1.725
R ²		0.7054			
Adjust-R ²		0.6033			
F-Statistic		34.174	0.000398		

*Note: Significance is displayed at the following levels * $p > 0.1$; ** $p > 0.05$; *** $p > 0.01$*

The coefficient for *the level of education* dummies indicate that respondents holding high school education and trade, technical and college degree have lower beef production compare with producers having university degrees or higher, thus corresponding to previous research (Johnson et al., 2010; Pruitt et al., 2012). Also, experience was negatively associated with beef production. A one-year increase in experience decreased the beef production by 1.151 lbs., which is an unexpected result.

The construct of market orientation was significant. This is consistent with previous research that found market orientation is important in determining overall performance (Eris et al., 2012; Micheels & Gow, 2014; Micheels et al., 2010). In this thesis, beef production efficiency was directly affected by market orientation. Therefore, on the basis of the analysis made, it can be said that market oriented producers can achieve better performance.

Furthermore, benchmarking was positively associated with beef production. Cow-calf producers who use benchmarking increase total beef production by roughly 60 lbs per exposed female, holding other variables constant. This finding supports the hypotheses in Chapter 3. Based on this thesis, benchmarking can offer considerable insight to a herd's economic and production performance.

5.5 Summary

Chapter 5 has outlined the results from the analysis of the Western Canadian cow-calf producer survey, and estimations are carried out using Binary Logit and Ordinary Least Squares models. The chapter's purpose was to examine the factors affecting the utilization of record keeping and benchmarking using a Binary Logit model. An Ordinary Least Squares model was applied to examine how managerial and structural factors, in addition to record keeping and benchmarking,

affect overall performance as defined to be pounds weaned per female exposed. First, the results from the Binary Logit model estimates indicate that learning oriented cow-calf producers are more likely to consider using record keeping and benchmarking. Although some parameters were not significant, many interesting results were still found in the Binary Logit models. Secondly, beef production efficiency was affected by market orientation, learning orientation and benchmarking. These results were discovered by using an Ordinary Least Squares model. The following chapter provides a detailed discussion of the findings, explains the managerial implications and policy implications, and provides recommendations for future studies.

Chapter 6: Discussion and Implications

6.1 Introduction

The purpose of this thesis was to examine how record keeping and benchmarking affect production and performance on cow-calf operations in Alberta, Saskatchewan, and Manitoba. To achieve this goal, the thesis was designed to examine how market orientation and learning orientation mediate the relationship between management tools and beef production efficiency (overall performance). In addition, this thesis looked at opportunity discovery within cow-calf operations, and what producers are doing to become more profitable.

These questions were investigated using Binary Logit and Ordinary Least Squares models. The constructs of market orientation and learning orientation were included in both models. Specifically, a Binary Logit model was used to examine the factors affecting utilization of record keeping and benchmarking, and an Ordinary Least Squares model was applied to examine how managerial and structural factors, in addition to record keeping and benchmarking, affect production efficiency. The theoretical implications of the findings reported in Chapter 5 are discussed in Section 6.2. Section 6.3 deliberates the managerial implications of this thesis, while policy implications are discussed in Section 6.4.

6.2 Theoretical Implications of the Findings

The findings reported in Chapter 5 provide support for several of the hypothesized relationships. This thesis investigated if cow-calf producers who use record keeping and benchmarking to identify productivity gaps and discover opportunities have improved performance. Analyzing records and using benchmarking will require producers to manage and develop procedures to identify gaps in order to improve production. Specifically, the thesis shows a relationship of

record keeping, benchmarking and beef production efficiency, moderated through a learning orientation. Moreover, besides a learning orientation, other independent variables also explain the relationship between the record keeping, benchmarking, and beef production efficiency (overall performance).

One main finding was that a learning orientation is positively correlated with both records keeping and benchmarking, which also leads to increased production efficiency. This provides support for Hypothesis 2. This result partially corroborates the conclusions of Slater & Narver (1995) as it shows that benchmarking helps learning oriented producers create new knowledge that creates opportunities for the farm business. In this thesis, the results show that a learning orientation mediates the relationship between management tools and production efficiency. One of the reasons for this might be that the most important and common means to learn and identify opportunities are by comparing cow-calf producers to themselves first (year over year comparison), and then through benchmark comparisons with other cow-calf producers. Following Sinkula, Baker, & Noordewier, (1997), the learning oriented firms are encouraged to “challenge the status quo”. A learning orientation represents a key resource in which the cow-calf producers can leverage themselves through detailed production records analysis to become aware of specific areas that could help them improve beef production. Therefore, improving farm performance might depend on both internal (record keeping) and external (benchmarking) resources developed and fostered through a learning orientation.

This thesis shows there is a positive effect of market orientation on beef production efficiency. A competitor orientation would provide cow-calf producers the ability to identify opportunities others have exploited, while a consumer orientation would help producers to understand buyers’ demands through communication with buyers (e.g. order buyers and feedlot

owners). Therefore, market-oriented producers are able to attain higher productivity and produce more weaned calves through the factors of competitor orientation and consumer orientation.

Control variables such as location, herd size, education level, production goal setting, and the share of family income derived from the beef operation all had significant impacts on the relationship between management tools and beef production efficiency. Significant record keeping and benchmarking adoption differences exist by region, potentially reflecting different priorities or rates of implementation by provincial governments. The results show that the greater record keeping and benchmarking users are in Alberta, whereas the lower users are generally in Saskatchewan and Manitoba. The reason behind these regional differences could be explained by different extension programs promoted by each provincial government. Alberta Beef Producers, for example, have been paying more attention to *Agri-Benchmark*¹¹ research for the cow-calf industry during 2013. Similarly, the Saskatchewan Ministry of Agriculture engages with producers on initiative like the *21 Day Calving Challenge*¹² to teach producers about the importance of following Recommended Management Practices (RMPs) and keeping records. Compared to Alberta cow-calf producers, Saskatchewan producers might take more time to realize the benefits that these management tools bring to their business.

Herd size affects adoption of detailed production record keeping with larger producers being less likely to maintain detailed records. One reason could be time and labour availability.

¹¹ Agri-benchmark is an international, independent and nonprofit network which is coordinated by a German research institution. Agri-benchmark uses a consistent methodology to compare production systems and their economics world-wide. In the area of beef production, this provides a unique data set addressing the challenges of different production practices. More information is available: <http://www.canfax.ca/Samples/CowCalf%20COP%20Analysis.pdf>

¹² The main purpose of the 21 day calving challenge is to encourage cow-calf producers to record calving dates and use the information to calculate their calving distribution. The pocket calving book administered as part of the initiative includes cow herd reproduction tips to improve the average weaning weight for calves. More information is available: <http://www.agriculture.gov.sk.ca/SC-Outlook1411-21-day-challenge>

Since most cow-calf producers in this sample are family businesses, having more detailed production records means that producers need to spend more time to maintain records. Also, labour is a limiting factor in family businesses. If the owner wants to hire more workers to maintain production records, the costs of operation will increase. This result is interesting as normally the fixed investment of capital and labour leads to greater adoption of technology among larger-scale operators. However, this result did not support the economies of size in adoption of record keeping, because there are many small-scale producers in this sample. This result corroborates the conclusions of Falconer et al.(1999), who found that economies of size only exist up to 1000 head.

This thesis reveals that there is a significant impact of level of education on the use of benchmarking and recordkeeping. However, the results show that increasing education levels do not have a positive impact on adoption and utilization of production records and benchmarking, contrary to previous studies (Pruitt et al., 2012). Interestingly, the producers holding a trade/technical or college degrees are less likely to use benchmarking. These trade/technical schools mainly focus on welding, mechanical training, and some level of crop and animal production training rather than farm business management training.

In this thesis, older cow-calf producers maintain detailed production records because it may have been recommended or promoted by industry organizations and government programs. Moreover, experienced producers also maintain detailed production records. These results suggest that older cow-calf producers who maintain records and have more years of experience likely had a better understanding of their businesses than less experienced producers. In other words, more experienced producers can manage their herds better through record keeping than less experienced producers. Producers who maintain records were able to better manage their

animals because of their gained knowledge from analyzing production records, thus the benefits of record keeping for cow-calf producers can be evaluated in the long run. If it was not a beneficial tool, producers would have stopped the collection of records. Furthermore, to satisfy emerging markets and consumer demands to know how their food was raised, tracking data on production practices is likely to grow in importance. Likewise, producers who want to differentiate their products from commodity beef will need records to verify their claims.

Reliance on cow-calf income matters in maintaining record keeping and use of benchmarking for cow-calf producers. Vilorio Carrillo (2010) also found producers who derive a large portion of their income from hog production to be more likely to maintain detailed records. Such results were not surprising as producers who derive a greater percentage of family income from their operation have a greater incentive to maximize profit. In other words, when more of a producers' family income comes from the operation, they have greater need to make the business succeed.

Establishing realistic production goals has been shown to be important for beef producers (Pruitt et al., 2012). One production goal for cow-calf producers should be to reduce days on winter feed while maintaining consistent quality weaned calves. In order to facilitate this improvement, maintaining records is required. Goal setting aids in efficiently allocating beef production resources, via record keeping, to achieve and improve operations.

Beef productivity measures affected average weaning weights in this thesis, which was consistent with Ramsey et al., (2005). As total average weaning weights increased, beef production also increased, so total pounds weaned per cow exposed is an important factor to determine if cow-calf producers are a high or low cost operation. Moreover, the use of a paid consultant, a veterinarian and discussion groups were positive and significant for beef

production. In the sense, the coefficient sign on these three variables suggests that seeking advice from a paid consultant, a veterinarian and other cow-calf producers can improve beef production efficiency. Furthermore, the use of a banker or accountant was negative for beef production. Bankers and accountant would not have any expert advice on improvement of beef production, as their focus would be on the reduction of costs and the financial side of the business.

Mainly, benchmarking and record keeping enable a farm to attempt to close both opportunity and production gaps to better compete with other producers in the industry. Using benchmarking enables producers to identify where production practices can be changed to improve the operation. In other words, using benchmarking might change producers' behaviors or attitudes through awareness from successful producers. More specifically, utilizing benchmarking can build an environment that creates constant learning and results in improved performance. The empirical results suggest that the use of benchmarking can result in a return of approximately 60 lbs/exposed female. Based on results, benchmarking was one of the important factors directly affecting by pounds weaned per exposed female (beef production).

6.3 Managerial Implications

This thesis provides detailed explanations of how appropriate management tools, specifically record keeping and benchmarking, are important for beef production and overall performance on prairie cow-calf farms. There are several factors that can be used to improve efficiency and to establish a farmers' business learning capability.

First, this thesis examines how record keeping and benchmarking are important tools for cow-calf farmers to become aware of productivity gaps and to identify opportunities. In order to

be more efficient and productive, learning oriented cow-calf producers use record keeping and benchmarking. For example, self-comparison via detailed production records requires producers to assess their own strengths and weakness and to identify deviations from historical performance. The purpose of self-comparison is to gain experience and identify opportunities to improve performance. Therefore, it is critical to develop measurable indicators that permit inter-firm comparisons through record keeping. In addition, benchmarking is a way to compare performance metrics with other producers and industry organizations (e.g. WBDC). Producers can increase their awareness of costs and production after the comparison. Benchmarking was one of the key success factors for beef production. For instance, see Figure 6.1, which shows that Saskatchewan 500- 600 lb. steers were averaging \$120/cwt in 2010 (assuming a long term environment price for steer) and \$220/cwt in 2014 (assuming a current market price). Assuming a herd with 145 exposed cows¹³, with no death loss and a 100% birth rate, and a benchmarking coefficient of 60 lbs. per exposed female (originating from OLS output results), the extra production would amount to an additional 8,700 lbs. weaned through the use of benchmarking to assess and improve their operations. Based on these results, a cow-calf producer using benchmarking could gain an extra \$19,130 per one breeding cycle in *high steer price environments* and can potentially earn an additional \$10,440 per year when the steer price in *long term steer price environments* (Table 6.1). Thus, use of benchmarking can help the producer to achieve higher productivity and generate more pounds of weaned calf to sell, therefore, producers could earn extra revenue.

¹³ Data regarding “average number of females exposed” is derived from a survey in March, 2015, rather than the survey conducted specifically for this research. There are up to four surveys administered each year, to the producers in the 5-year BCRC-funded study led by Dr. John Campbell.

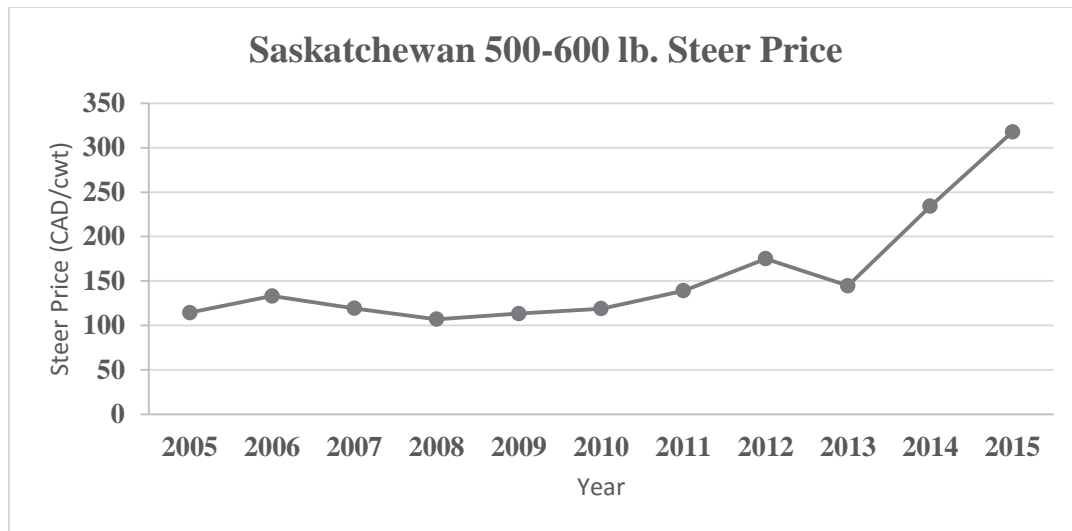


Figure 6.1: Saskatchewan 500- 600 lb. Steer Price

Source: Government of Saskatchewan (2016)

Use of a veterinarian and discussion groups also plays an important role, which helps producers to become aware of opportunities to increase beef production efficiency. This is due to the fact that getting help through a veterinarian helps to avoid potential inefficiencies and consequently increases the probability of success and improves producer's performance. Similar to benchmarking, for instance, in Table 6.1, discussion groups could help cow-calf producers to gain an extra \$8,294 per one breeding cycle in *high steer price environments* and can potentially earn an additional \$4,524 per year in *long term steer price environment* while the discussion group coefficient is roughly 26 pounds per exposed female. In addition, building bonds with experienced cow-calf producers is important; within that group producers could share experiences, identify weaknesses from other producers and confront and solve challenges. Therefore, a closer relationship with experienced cow-calf producers and veterinarians could be a valuable resource for cow-calf producers to improve their beef production.

Table 6.1: Estimated Potential Value for Cow-calf Producers

	High (current) Steer Price (SK 550 lb. steers averaged \$220/cwt in 2014)	Long Term Steer Price (SK 550 lb. steers averaged \$120/cwt in 2010)
Benchmarking (coefficient is 60)	\$ 19,130.00 per year	\$ 10,440.00 per year
A discussion group (coefficient is 26)	\$ 8,294.00 per year	\$ 4,524.00 per year
Market orientation (coefficient is 34)	\$ 10,846.00 per year	\$5,916.00 per year
Learning orientation (coefficient is 12)	\$ 3,828.00 per year	\$ 2,088.00 per year

The third suggestion is to exploit producers' learning skill by effectively implementing the management tools in order to improve performance on cow-calf farms. This is important because learning is presented as an organizational routine (Calantone, Cavusgil, & Zhao, 2002). Continuous learning and improvement are essential steps to success in a competitive industry. In such case, learning orientation is the key factor for the producer to become successful and improve their business in a competitive industry. In other words, with organizational learning designed as a key strategic resource, record keeping and benchmarking are managerial tools that facilitate learning and have positive implications for performance. For instance, learning oriented producers who maintain detailed production records focus on performance of individual females rather than the overall herd level. Focusing on the individual level is important for cow-calf producers to understand their current business. The empirical results indicate that a learning oriented producer would receive an extra \$ 3,828 per breeding cycle (Table 6.1) if this producer sells about 145 head annually (assumes no calf death loss and a 100% conception rate) and the average steers' price in 2014 is around \$220 per cwt. Furthermore, improvements can be made from an individual producer's perspective if only this producer knows where he/she stands in relation to other producers in the industry. Benchmarking could be another important

management tool that is used to assess improvements in performance. Therefore, it is important to gather data, information and knowledge from both inside and outside the organization through record keeping and benchmarking. Only then, can a cow-calf producer learn from this information in order to improve their overall performance. Cow-calf producers should continuously learn and use appropriate management tools in a timely routine.

The final recommendation is to promote record keeping and benchmarking. Both managerial practices played an important role in the cow-calf sector because these strategies were found to assist in improving beef efficiency and overall performance. Benchmarking is a process that makes it possible to review and compare a producers' business to find opportunities to improve efficiency and profitability. Having comparable, quality data is a key step to making decisions. As a result, taking specific actions is crucial to long term success. In this thesis, benchmarking is promoted widely as a best management practice and is important to cow-calf producers, and industry needs to ensure relevant and current benchmarks are available. Effective use of benchmarking is probably one of the most important tools and skills for cow-calf producers. Cow-calf producers that use benchmarking can improve cattle efficiency and increase the profitability of their business.

6.4 Policy Implications

In Canada, the beef industry is an important sector, so the Canadian federal and provincial governments support beef producers in many ways. Federal and provincial governments support innovation and competitiveness funding to guide beef producers to maintain competitive and sustainable businesses. For instance, *Growing Forward 2* is an agricultural policy program that promotes the long-term productivity and profitability of Saskatchewan farmers and helps them to

manage risk through suitable Business Risk Management Programs. Specifically, the Farm Business Development Initiative (FBDI) program is funded through *Growing Forward 2* (Federal government) in Saskatchewan, which covered a proportion of various costs in the areas of business practices, such as the cost of paid consultants.

Other information provided in this thesis was that Saskatchewan and Manitoba cow-calf producers are less likely to maintain production records and use benchmarking than producers in Alberta. Since cow-herd reproduction is the most important factor affecting the cow-calf producers' performance, using record keeping to monitor cow-herd reproduction is a key step. For example, the Saskatchewan government is promoting producers participation in the *21 Day Calving Challenge*, which invites all Saskatchewan cow-calf producers to record calving birth record to evaluate their calving distribution and see if their herd meets the recommended industry target of 60% of females calving in first 21 day of the calving season. Moreover, benchmarking is also important, as it provides an opportunity to see if one's operation is excelling in certain area or lagging behind in others. Understanding other farmers and the whole industry's practices, cow-calf producers are able to apply this information to their farms. It is important for institutions like the Western Beef Development Centre to continue beef production surveys as a form of public information. The surveys' result (benchmarking) supports producers' overall performance decisions, aids academic research, and enables policy makers to develop appropriate tools to improve agricultural productivity.

As of 2015, the Saskatchewan Government is stressing the importance of keeping record and provides workshops (e.g. *Saskatchewan's 21 Day Calving Challenge*) for producers. However, other institutions (trade/technical Colleges, high schools, on-line self-study programs) should pay more attention to farm management training programs (livestock) and related classes

and sessions. The programs can teach specialized farm management skills in beef, dairy and swine industry, which might include topics like breeding and herd maintenance along with management practices tools, such as: record keeping and benchmarking. Furthermore, high schools could offer a section in business classes that is related to agricultural production, such as: record keeping seminars. Likewise, trade/ technical colleges could also focus on livestock production training. For instance, Vermilion and OLDS colleges in Alberta offer such training, while the University of Saskatchewan and SIAST have closed vocational agricultural programs.

This chapter summarized the main observations and findings in this thesis which is on learning orientation, record keeping, and benchmarking and those applications to cow-calf management. Moreover, this chapter explained the managerial implications and policy implications. These implications should be valuable for cow-calf producers in their future operation. Chapter 7 will include a summary of this thesis, the conclusion, limitations of this research, and suggestions for further research on relevant topics.

Chapter 7: Summary and Conclusion

7.1 Summary

This thesis developed an analytical framework to examine the use of management tools, specifically record keeping and benchmarking, that improves beef production efficiency in the Prairie cow-calf industry. In addition, the thesis was designed to examine how market orientation and learning orientation mediated the relationship between management tools and beef production efficiency. This analysis was organized into seven chapters, briefly reviewed in this subsection. The following section provides the limitation of this thesis and recommendations for future research.

Chapter 2 examined related research contributions in the literature. Managerial factors, structural factors and management tools, each with a different perspective but a significant contribution to the current agriculture industry, were briefly presented. The review started with the presentation of the current research, including the adoption of technologies and practices, and contribution on the return of performance. Research on the adoption of management tools, namely record keeping and benchmarking, is limited, especially in the beef industry.

The introduction of record keeping and benchmarking in the beef industry, as described in Section 2.2, creates an incentive for cow-calf producers to use these management practices tools that could help them to improve beef production efficiency and overall performance in a competitive market. The literature review also covers managerial factors including market orientation and learning orientation and structural factors (product differentiation and efficiency). These factors focus on how producers use record keeping and benchmarking to identify weakness and opportunities in order to improve performance of their operation.

The several areas of literature reviewed in Chapter 2 were combined and built upon in Chapter 3 to develop the theoretical framework. Specifically, in Chapter 3, the strategic repositioning framework was modeled to identify production and opportunity gaps that producers can solve through recommended management practice tools. Market orientation and learning orientation in this instance were used to examine the relationship between recommended management practice tools and beef production efficiency as well as overall performance. Several propositions were proposed in Chapter 3 based on the literature and theoretical framework.

Chapters 4 and 5 of the thesis present empirical evidence to support the theoretical models of the previous chapters. Specifically, in these chapters, a description of how data for this thesis was gathered was provided. The information gathered was analyzed using factor analysis, a binary logit model, and an ordinary least squares model. Factor analysis was used to examine the market orientation and learning orientation constructs. Then, the binary logit model was applied to examine the factors affecting the utilization of record keeping and benchmarking. Some of the propositions derived in Chapter 3 identify how a number of independent (exogenous) variables affect the adoption of management tools. These propositions are used to examine part of the relationship in record keeping, benchmarking and overall performance. Hence, in the binary logit model, management tools were chosen as dependent variables, while the independent variables used in the first part of analysis are: market orientation, learning orientation, family income derived from the operation, age, experience, education level, herd size, locations, winter feeding costs, goal setting, the influential functionary in decision making process and off-farm work

Furthermore, in order to examine the improvement of overall performance, the OLS analysis was employed. Beef production efficiency was selected for the second part of this empirical analysis because production efficiency can directly represent/measure farmers' performance in the cow-calf industry. The independent variables for the ordinary least squares analysis are similar to the binary logit model.

In Chapter 6, the econometric results provide empirical evidence to support the theoretical model developed in previous chapters. Specifically, it was found that learning orientation has positively influenced record keeping and benchmarking; also, benchmarking directly affects beef production efficiency. These results provide empirical evidence that *continuous learning* is an important management tool to cow-calf producers. In other words, the results of this regression analysis indicated that learning oriented cow-calf producers most likely use record keeping and benchmarking. In addition to its impact on the learning process, farmers who have already used benchmarking can capture more information and knowledge from organizations and other farmers because using an appropriate management tool can improve beef production efficiency.

7.2 Limitation of This Thesis

Based on the survey data, this thesis provides some insight about the use of record keeping and benchmarking in the Canadian cow-calf industry could improve beef production. However, there are a number of limitations to this analysis that could be addressed moving forward.

One of the limitations of this thesis is its range. The respondents were not randomly selected since all the respondents are part of Prof. John Campbell's panel. Although this survey sample was roughly acceptable to represent Canadian cow-calf producer distribution by Alberta

and Saskatchewan provinces, Manitoba producers were less than represented by Manitoba population of cow-calf producers. Therefore, this sample would have biases.

Sample size could be another limitation in this thesis. The factor analysis, which was used to examine the market orientation and learning orientation, is typically a larger sample size technique. Sample size bias would decrease representativeness. However, for this thesis the sample size was a reasonable representation of the Canadian cow-calf sector as the panel surveyed was recruited to reflect the beef industry.

Winter feeding costs should be an important factor in determining beef production. However, the OLS model suggested *winter feeding costs* variable is not significant, which is measured as average \$2.50 per day multiplied by days of winter feeding. Due to the possibility that surveyed producers in this sample might have had higher or lower costs than the average price of \$2.50 used in the analysis, which could lead to inaccurate variation of the average winter feeding cost. Moreover, estimation of winter feeding days is imprecise. Some of the respondents did not provide exact dates, but provided estimated dates instead.

7.3 Areas of Future Research

This thesis focuses singly on beef production efficiency due to the data limitation. However, feed efficiency is also important for cow-calf producers. According to Beef Cattle Research Council (2015), the production of high quality and high yielding feed grains are highly important for animals to convert feed into increased body weight gain. The Beef Cattle Research Council (BCRC) has been funding research on improving feed efficiency in a number of areas such as: animal breeding, improving feed supply and utilization, and improving management of manure nutrients (Beef Cattle Research Council, 2015). These research areas should be able to improve

new feeds and alternative feeding strategies in order to achieve better feed efficiency for cow-calf producers(Beef Cattle Research Council, 2015). Consequently, it is also interesting to investigate feed efficiency through record keeping and benchmarking.

Moreover, many producers have voiced concerns regarding the growing importance of sustainability in the Canadian beef industry. Optimizing efficiency in the cow-calf sector is an important step toward improving beef sustainability. Several organizations and priority initiatives have been considered and support this change in the beef industry. In order to improve beef sustainability, maintaining records is needed. For instance, the Canadian Roundtable for Sustainable Beef is addressing sustainability for the beef industry. One of the principles for the Canadian Roundtable for Sustainable Beef (CRSB) is “continuous learning”. All members of the CRSB agree that ongoing education and learning within industry is necessary for beef industry sustainability. “Efficiency& innovation” is another important principle because industry competitiveness is enhanced when efficiency/innovation is encouraged and production is optimized. Obviously, the program aims to identify and evaluate increased adoption of current leading production and management practices; also, gathering information and sharing with beef producers and industry to lead the development of sustainable beef in Canada. Again, in order to accomplish this program and benefits for beef producers record keeping and benchmarking are needed.

Furthermore, in other protein industries, such as pork and poultry, there have been expectations put in place on how producers should raise their animals. For example, Tim Horton’s is requiring suppliers provide enriched housing for laying hens and eliminate gestation stalls (for sows). Beef is starting to face similar demands; A&W’s decision to serve beef that has never received antibiotics or implants has meant they source a great deal of their beef from

outside of Canada. McDonald's has a Pilot Project underway that will look to source a portion of its beef from verified sustainable sources; two requirements of the operations providing the sustainable beef to McDonald's is enrolment in the Verified Beef Production program and participation in *Beef InfoXchange System* (BIXS). These programs require record keeping as well.

7.4 Conclusions

This thesis has outlined several influential factors that can be considered in addressing beef production efficiency. One of the findings indicates that the use of benchmarking and record keeping lead to increased beef production efficiency. Moreover, possible factors were examined, which can affect cow-calf producers adoption of record keeping and benchmarking methods. The results indicated that a successful learning orientation has consequences that lead to overall performance when cow-calf producers use recordkeeping and benchmarking. Furthermore, a cow-calf producer is likely to achieve greater beef production because of market orientation and learning orientation focus on monitoring competitors, buyer satisfaction, operational efficiency, and continuous learning.

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Appendix

Western Canadian Cow-Calf Management and Marketing Survey

THIS QUESTIONNAIRE IS PART OF THE RESEARCH FOR THE AFBI FUNDED MARKETING AND MANAGEMENT.

Your participation is voluntary. All of your responses will be kept confidential. We expect that completing this survey will take you about half an hour to an hour. Return of our questionnaire by mail, will indicate your consent to participate in the survey and have your responses summarized in the final report.

- Please answer each question in the questionnaire, and you can choose not to answer individual questions.
- Please add any comments you may wish to make at the end of the questionnaire.
- Please return the questionnaire in the provided stamped envelope.
- Pages have questions both sides.
- Please send back each page of the questionnaire.
- Answer each question as best as you can; if something else should have been asked or included, please write us a note to explain.

Please enter your name: _____

If you have any questions regarding the questionnaire, feel free to call:

Dr. Sarah Parker at the Western College of Veterinary Medicine; (306) 966-1994
Or e-mail sarah.parker@usask.ca

Dr. Eric Micheels at the agriculture college of Bioresource Policy Business & Econ;
(306) 966-8411
Or e-mail eric.micheels@usask.ca

A. Please check which of the technologies and practices listed below were utilized on your beef cow-calf operation in 2014:

	Yes
Implants	<input type="checkbox"/>
Ionophores	<input type="checkbox"/>
Use of a Nutritionist	<input type="checkbox"/>
Forage/feed testing	<input type="checkbox"/>
Defined Breeding Season (of no more than 63 d)	<input type="checkbox"/>
Estrus Synchronization	<input type="checkbox"/>
Artificial insemination	<input type="checkbox"/>
Sexed semen	<input type="checkbox"/>
Embryo transfer	<input type="checkbox"/>
Multi-sire breeding pastures	<input type="checkbox"/>
DNA Parentage (e.g.: Q-link)	<input type="checkbox"/>
Genetic Testing (e.g.: Leptin, BovineSNP50)	<input type="checkbox"/>
Individual female production records	<input type="checkbox"/>

B. Below are four sections of statements related to marketing your cattle.

Section One: Competitors

*Please indicate your agreement with the following statements, please **circle an appropriate number:** (1 Strongly Agree, 2 Agree, 3 Neither Agree nor Disagree, 4 Disagree, 5 Strongly Disagree)*

1. We discuss information concerning competitors' (neighbours and other cattle producers) strategies.	1	2	3	4	5
2. We are quick to respond to competitive actions that threaten our operation.	1	2	3	4	5
3. We target buyers where we have, or can develop, a distinct advantage.	1	2	3	4	5
4. We regularly discuss competitors' (in our case, it refers to neighbor and other cow-calf producers') strengths and strategies.	1	2	3	4	5
5. We regularly visit current buyers to see how our cattle are meeting their needs.	1	2	3	4	5
6. We discuss reasons for successful and unsuccessful buyer experiences on a regular basis.	1	2	3	4	5
7. We coordinate all of our business functions (from buying to producing, selling and accounting) in order to better serve the needs of our target markets.	1	2	3	4	5
8. We understand how everything in our operation can contribute to creating market value.	1	2	3	4	5

Section Two: Buyer

Please indicate your agreement with the following statements, please **circle an appropriate number**: (1 Strongly Agree, 2 Agree, 3 Neither Agree nor Disagree, 4 Disagree, 5 Strongly Disagree)

1. The business objectives on our operation are driven by consumers (in our case, it refers to the feedlot owner buying a producers' cattle) satisfaction.	1	2	3	4	5
2. We continually monitor our level of commitment to serving market demands.	1	2	3	4	5
3. Our strategy to improve performance is based on our understanding of what the market wants.	1	2	3	4	5
4. Our strategies are driven by our beliefs about how we can create greater value for our buyers.	1	2	3	4	5
5. We measure buyer satisfaction regularly.	1	2	3	4	5
6. We pay close attention to our buyer, even after our cattle are sold.	1	2	3	4	5

Section Three: Learning

For each statement circle the number that matches whether you agree or disagree with each statement. Please **circle only one number**: (1 Strongly Agree, 2 Agree, 3 Neither Agree nor Disagree, 4 Disagree, 5 Strongly Disagree).

1. We basically agree that our farm/ranch's ability to learn is the key to our competitive advantage.	1	2	3	4	5
2. The basic values of this farm/ranch include learning as key to improvement.	1	2	3	4	5
3. The sense around here is that learning is an investment, not an expense	1	2	3	4	5
4. Learning on my farm/ranch is seen as a key commodity, necessary to guarantee survival.	1	2	3	4	5
5. Our culture is one that does not make learning a top priority.	1	2	3	4	5
6. The collective wisdom on this farm/ranch is that once we quit learning, we endanger our future.	1	2	3	4	5

Section Four: Decisions

For each statement circle the number that matches whether you agree or disagree with each statement. Please **circle only one number**; (1 Strongly Agree, 2 Agree, 3 Neither Agree nor Disagree, 4 Disagree, 5 Strongly Disagree).

1. We are not afraid to reflect critically on the beliefs and assumptions we have about the way we ranch/farm.	1	2	3	4	5
2. Decision-makers on this farm/ranch do not want their “view of the world” to be questioned.	1	2	3	4	5
3. Our farm/ranch places a high value on open-mindedness.	1	2	3	4	5
4. All labourers on this farm/ranch – paid and unpaid - are encouraged to “think outside of the box.”	1	2	3	4	5
5. An emphasis on constant innovation is not a part of our farm/ranch’s culture.	1	2	3	4	5
6. Original ideas are highly valued on this farm/ranch.	1	2	3	4	5

C. The following section of this survey will ask you some questions regarding your individual operation.

1. What percentage of your **farm income** is derived from your cow-calf enterprise (i.e. sale of weaned calves, cull cows and bulls DO NOT includes sales from feeders, grassers or open replacements)?
 - a. 0-24.99%
 - b. 25%-49.99%
 - c. 50%-74.99%
 - d. 75% or more
 - e. Prefer not to answer
2. What percentage of your **family income** is derived from your cow-calf operation?
 - a. 0-24.99%
 - b. 25%-49.99%
 - c. 50%-74.99%
 - d. 75% or more
 - e. Prefer not to answer
3. Does the principal operator work off the farm?

- a. Yes, part time
- b. Yes, full time
- c. Not at all
- d. Prefer not to answer

4. What was your gross farm/corporate revenue in 2014?

- a. Under \$100,000
- b. \$100,000-\$249,999
- c. \$250,000-\$399,999
- d. \$ 400,000 - \$549,999
- e. Above \$550,000
- f. Prefer not to answer

5. Do you discuss your records and business plans with any of the following? Please indicate in the following box:

(Please check **all** that apply)

	Overall farm performance decisions	Financial decisions	Production decisions	Marketing decisions
Banker/accountant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paid consultants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Veterinarian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ag Extension personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spouse/other members of the family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other farmers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A discussion group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No one else	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D. Financial Records

6. Please Circle “YES” or “NO”

Do you set financial goals for your farm business?	YES	NO
Do you reflect on past financial performance to identify opportunities for improvement?	YES	NO
Do you set production goals for your farm business?	YES	NO
Do you reflect on past production performance to identify opportunities for improvement?	YES	NO

7. Who mostly maintains financial records in your operation?

- a. Family member (Husband, wife or other)
- b. Accountant
- c. Nobody, do not keep or maintain any financial record
- d. Prefer not to answer

(If you ***do not keep or maintain any financial records*** skip questions 8-10 and proceed to Production Records Section)

8. How do you maintain financial records?

(Please circle **all** that apply)

- a. Hand written in a notebook/ledger book
- b. Electronically on my computer/tablet
- c. Keep required information in my head
- d. Accountant or consultant
- e. Other, please specify: _____
- f. Prefer not to answer

9. What are your farm/operation financial records used for?

(Please circle **all** that apply)

- a. Tax preparation
- b. To satisfy lenders
- c. Conduct annual analysis of whole farm financial performance
- d. Conduct cost of production analysis of individual farm enterprises
- e. Calculate break-evens
- f. Other uses, please specify: _____
- g. Prefer not to answer

10. Which following options does your operation most frequently use to assess farm performance?

- a. Net cash income
- b. Gross cash income
- c. Accrual net farm income
- d. Checkbook balance
- e. Return on assets
- f. Production per cow
- g. Prefer not to answer

E. Production Records

11. Who mostly maintains production records in your operation?

- a. Husband
- b. Wife
- c. Consultant
- d. Nobody, do not keep or maintain any production records
- e. Other, please specify: _____
- f. Prefer not to answer

(If you *do not keep or maintain any production records* skip questions 12 to 15)

12. What do your cow-calf production records include?

(Please circle **all** that apply)

- a. Birth weight
- b. Birth date
- c. Individual ID
- d. Calf's ID linked to dam ID
- e. Weaning weight
- f. 205 day Adjusted Weight
- g. Culling/Death loss records
- h. Health records
- i. Prefer not to answer

13. What are your production records used for?

(Please circle **all** that apply)

- a. Culling decisions
- b. Sire selection
- c. Replacement Heifer selections
- d. Conduct annual analysis of whole farm production performance
- e. Conduct cost of production analysis of individual farm enterprises
- f. Calculate break-evens
- g. Other uses, please specify: _____
- h. Prefer not to answer

14. Where are you keeping your production records?

(Please circle **all** that apply)

- a. Pocket calving book
- b. Spreadsheet (e.g., MS Excel)
- c. Computer-based Record keeping program
- d. Smartphone app
- e. Other, please specify: _____
- f. Prefer not to answer

15. Do you compare your production records with industry benchmarks? If so, which benchmarking do you use, such as:

- a. WBDC (SK)
- b. Agriprofit\$ (AB)
- c. NCBA-IRM-SPA (US)
- d. Breed Association
- e. Do not use Benchmarking
- f. Other please be specific _____
- g. Prefer not to answer

16. In an effort to tie productivity to profitability, we require some financial and production details on your cow-calf operation starting with winter feeding in Fall 2013/14.

In Fall/Winter 2013, winter feeding started on: (provide date)	_____, 2013
In Spring 2014, my cows were turned out to pasture on:	_____, 2014
TOTAL Paid Grazing in 2014 (e.g. rented pasture, Community Pasture, grazing co-op, lease payments)	\$ _____
TOTAL Salt & mineral expenditure in 2014	\$ _____
TOTAL Purchased Feed expenditure in 2014	\$ _____
TOTAL Purchased Bedding Straw expenditure in 2014	\$ _____
TOTAL Veterinary & Medicine expenditure in 2014	\$ _____
TOTAL Gross Cull Sales (cows & bulls) in 2014	\$ _____
TOTAL Gross Breeding Stock Sales (bred cows) in 2014	\$ _____
TOTAL Breeding Stock Purchases in 2014	\$ _____

17. On your operation, provide head counts for the following in the 2014?

Number of Females Calved	#: _____
Number of Herdsires	#: _____
Number of Backgrounders Sold	#: _____
Number of Replacements Developed (<i>i.e. had 1st calf in 2015</i>)	#: _____
Number of Grassers Sold	#: _____
Number of Slaughter/Finished Head sold	#: _____

F. Marketing Questions

18. In the past three years have you used any of the following to manage price risk:

	Nearly always	Sometimes	Rarely, if ever
Futures contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Options contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cash (forward) contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WL price insurance program (WLPPI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. Did you and your business change the marketing plans from 2013?

- a. Yes
- b. No
- c. Prefer not to answer

**20. Following the previous question, if different from 2013, why did you change?
Please provide your answer and be specific:**

21. What are your plans concerning your cow herd size in 2015?

- a. Expand by 1 to 15%
- b. Expand by 16% or more
- c. Remain the same
- d. Contract by 1% to 15%
- e. Contract by 16% or more
- f. Exiting the industry (dispersal)
- g. Retire
- h. Prefer not to answer

22. If expanding, how will you accomplish your cowherd expansion?

(If not expanding in 2015, proceed to question 23.)

- a. Hold back heifers
- b. Buy replacements
- c. Sell fewer cull cows
- d. Lease cattle or run cattle on shares
- e. Prefer not to answer

23. What percentage of your cow herd are the following age classes? *(Numbers should add to 100%)*

- a. Under 5 years _____ %
 - b. 6-8 years _____ %
 - c. 9+ years _____ %
- 100%**

24. What is the highest level of education you have attained?

- a. High school
- b. Trade or Technical school (e.g. SIAST, PolyTechnic)
- c. College degree
- d. University degree
- e. Graduate or professional degree
- f. Prefer not to answer

25. Do you have any other comments?

- END OF SURVEY -